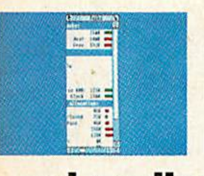
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BBC ACORN USER



EDUCATION
what role for computers in the classroom of the nineties?



ARC UTILITIES
creating custom display modes and reading Beeb discs



NEW PLACES
get more precision in your arithmetic on the Beeb and Master



REVIEWS
Arc DTP, discs, hypermedia, Beeb music, expansion, games

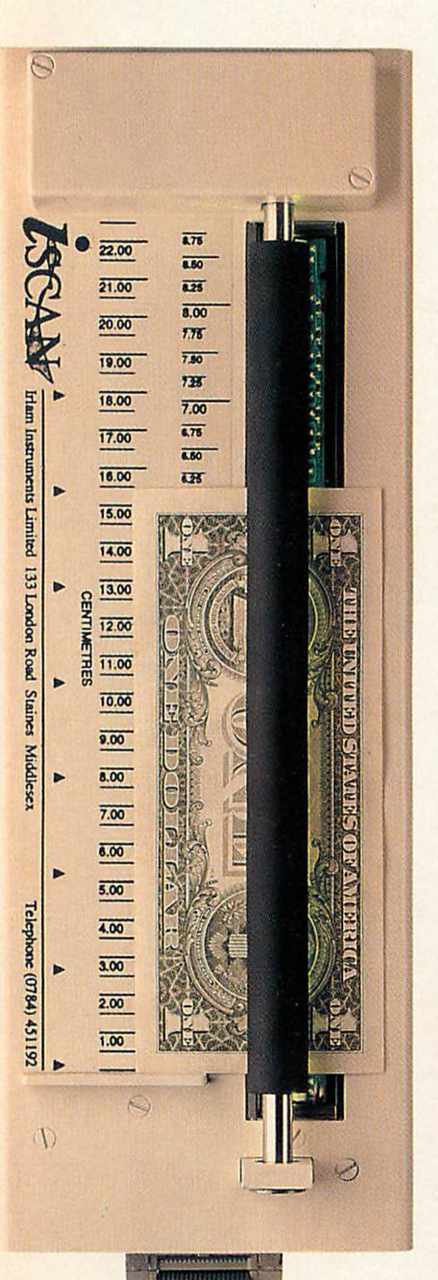
MICRO MAESTRO

music composition on the Beeb



SPECIAL OFFER PRICE
See below for details

HOW TO IMPROVE YOUR IMAGE



i-SCAN is the only scanner which has been specifically designed for the Archimedes. Future expansion capabilities for higher resolution and colour are already designed into the system.

i-SCAN consists of a scanning unit, expansion card, leads and software. The scanning unit has a precision motor driven paper transport mechanism which is more accurate than hand held scanners. i-SCAN can handle documents from postage stamp size up to A4 width. A full A4 page can be scanned in less than 20 seconds.

Other Archimedes scanners only produce monochrome images which are processed to produce a grey scale effect. i-SCAN images have 16 true grey levels and a resolution of 200 dots per inch (dpi), this is effectively equivalent to 800 dpi monochrome.

Software supplied with the package is completely Risc OS compatible. The scanned area is selectable to minimise memory used and subsequent editing. A window displays the scanned image where it can be enlarged or reduced. Programmable contrast adjustment caters for difficult images such as pencil drawings.

Images are saved as sprite files which can be used with !DTP, !Paint, !Draw and any other Risc OS application. Industry standard TIFF compressed files will soon be supported.



This image was scanned by i-SCAN

i-SCAN is supplied complete with expansion card, leads and software. All items carry a full one year guarantee.

For a limited period i-SCAN will be available for £579 plus VAT (usual price £679). Desktop publishing software is available at a special offer price when purchased with i-SCAN.

Please telephone Staines (0784) 451192 for more information.

i-SCAN is manufactured by Irlam Instruments Limited, 133 London Road, Staines, Middlesex TW18 4HN.



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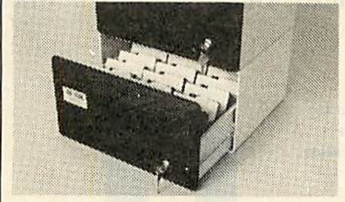
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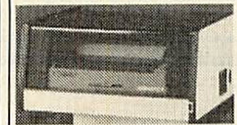
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PRODOT 9	H0102	£399	LC24-10	H0002	£269
HQP 40 (Colour)	H0103	£265	FR10	H0003	£370
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KXP 1081	H0200	£165	P2t	H0300	£325
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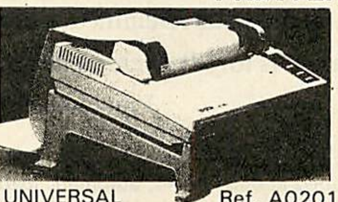
All parallel buffers have 36 pin female connectors as standard

PRINTER CONTROL CENTRE

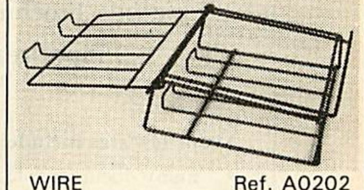
• SOFTWARE DRIVEN • KEYBOARD CONTROL

	Ref.	256K	Ref.	512K	Ref.	IMB
2 INPUTS/2 OUTPUTS	X0300	£285	X0302	£425	X0304	£730
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UNIVERSAL Ref. A0201
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WIRE Ref. A0202
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Made of moulded plastic.
Feeds and refolds paper underneath the printer.
Takes up hardly more space than the printer itself.



YUS-25A for 80 col. printer. Ref. A0203 **£27.90**
YUS-25B for 130 col. printer. Ref. A0204 **£32.50**

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Rugged steel frame.
Height adjustable basket for output paper & base shelf for input paper.
Self assembly – includes castors.
80 COL Ref. A0205 **£65.00**
132 COL. Ref. A0206 **£79.00**



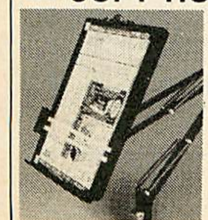
CABLES

	Ref.	
PARALLEL 25 PIN/36 PIN	A0801	£7.50
25 PIN MALE/25 PIN MALE	A0804	£8.50
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KEYBOARDS

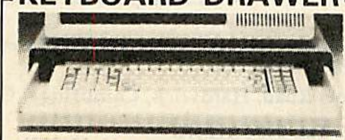
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Ref: A0501 **£29.50**

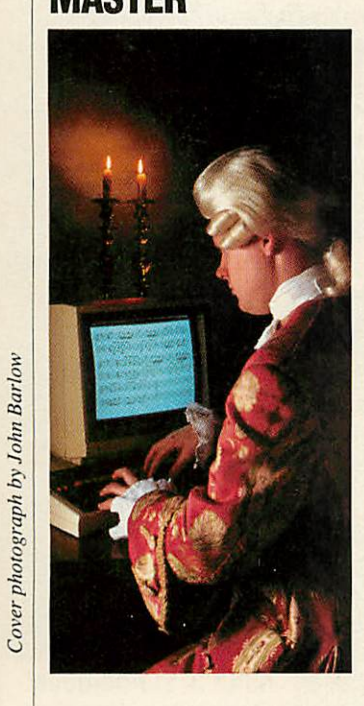
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IBM PX AT/COMP	2PC	C0109	£10.50	Amiga A500	1PC	C0102	£5.50
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Amstrad PC 2086	2PC	C0106	£10.50	Printers 132 Col*	1pc		£5.50
Amstrad PC W8256	3PC	C0103	£13.50	*Please specify printer			

BBC ACORN USER

MAY 1990 ISSUE No 94

66
BEAT MASTER



Cover photograph by John Barlow

119
PICKING UP THE PIECES



80
QUICK TURNAROUND



128
GAME SHOW





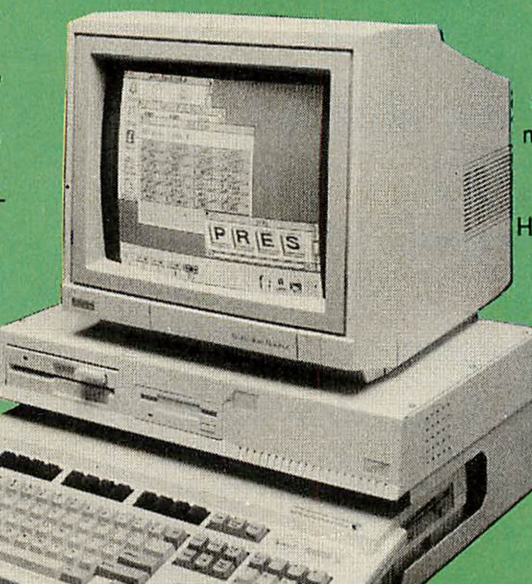
Tel: 0276 72046
Fax: 0276 51427

IN THE FOREFRONT OF A3000 UPGRADES

Pres is committed to providing a full range of compatible upgrades for the Archimedes A3000

The range starts with a carefully thought out monitor plinth 'A3K1' which allows the **A3000** to move freely back and forth making the most of limited desk space. In response from initial users we have also incorporated a way of preventing accidental access to the reset switch. Where security matters it is also possible to fix the plinth to a desk.

A3K1 is expandable to A3K2, a styled housing to take the **A3000** to a system. A3K2 is supplied with a post regulated, switch mode power supply and provides the means for adding up to 2 additional floppy drives (2 x 3.5" or 1 x 3.5" + 1 x 5.25") and a Winchester hard disc drive. All these can be added without having separate boxes hanging from the computer on ribbon cables.



PRES have also allowed for adding standard expansion cards (podules) on the rear of the machine. This is done by means of a casing which attaches and is fixed to the **A3000** case providing full protection for the expansion card. However it does not stop there. The case is expandable to take a backplane and expansion board which can accommodate FOUR mini cards. PRES will release the specification for the mini cards to any third party wishing to have their products on **A3000**. PRES are currently working on a range of Mini Cards, plans include . . . high spec analogue to digital converter, user ROM and battery backed RAM, SCSI, MIDI, 2nd. vdu.

A3K1 Monitor Plinth
£24.95

A3K2 System Housing
£69.50

A3K3 External Podule Case
£14.95

A3K6 Disc Buffer Board
£48.95

A3K12 65 Host DFS and DFS Filer
£19.95
Upgrade for A3K6

A3K7 Hard Disc Upgrade
£429.50
(includes hard disc controller card)

The addition of a 5.25" disc drive is made possible with the Disc Buffer Board (A3K6). It fits inside the A3000 and still allows for the 1MHz bus and user port to be fitted, allowing for maximum internal expansion. A3K6 is supplied with On Board firmware for assigning drive numbers and 40/80 stepping.

Another product to help users move forward from their 8 bit machines will be A3K12 . . . an ARM 1770 DFS for use with the new 65 Host. A3K12 is a ROM upgrade (for A3K6) and disc which allows 65 Host to be 'icon booted'. A3K12 also includes an invaluable DFS Filer, this is a desktop application which facilitates dragging DFS files from a viewer to an ADFS viewer or application (i.e. Edit): An easy way of getting at all those View files on 5.25" DFS!

PRES has not forgotten the internal expansion either . . . apart from a disc buffer board; there will also be options of User Port and 1 MHz bus. There are even more products being planned by PRES for future release, so . . .watch this space.

Please call for details of your nearest Acorn Dealer.

Dealer and Educational enquiries welcome

†Cabling required
All prices exclude VAT

A3K8 3.5" Additional Floppy Disc Upgrade
† **£75**

A3K9 5.25" Additional Floppy Disc Upgrade
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- You can order from what maybe **the largest range** of Archimedes software and hardware available anywhere
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- You will be entitled to a **member's discount** on a wide range of products, and **special discounts** on a variety of BEEGUG's own products
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News on the world of Archimedes, Utilities and useful Routines, Ready to run Applications, Reviews of the latest products, Hints and Tips on programming, Advanced programming techniques, Hardware series, Tutorial articles and beginner's guides, Postbag, Technical queries and expert answers



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ACORN AT WHICH?

Computing solutions will be the focus of the Acorn stand at this year's *Which?* Computer Show.

Held from April 24-27, Acorn will be demonstrating complete systems for the Archimedes 400/1, A3000 and its Unix R140 workstation.

Packages dealing with administration, management and training in the health service, education and government, as well as small businesses will be on show. Those demonstrating their wares include Foster Findlay and Wild Vision for image processing, and Westland System Assessment and Software Solutions with CBT software.

Oak and Silicon Vision will be demonstrating various CAD packages. Acorn will also be demonstrating its new CD-Rom drive which was first shown at BETT 90.

NEW NUMBERS

Please note that from May 6 the prefix for the *BAU* house telephone number will change from 01 to 071. This will also apply to our fax number. Callers from outer London (081) or beyond should use the new area code.

ACORN RE-ENTERS HOME MARKET WITH THE LEARNING CURVE

Acorn has launched a bundled package aimed at home users which includes an A3000, colour monitor and £300 worth of application software for just over £1000.

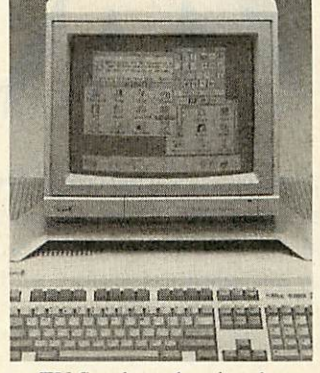
Launched in early April, The Learning Curve is an education-based package which aims to encourage the use of the A3000 for home learning.

The package includes Acorn's *First Word Plus* release 2 (see review on page 127), together with Software Solutions' hypermedia application, *Genesis*. A *Genesis* application and examples disc plus a version of the PC Emulator featuring DR Dos compatibility is also supplied.

Also included in the package is a 15 minute video hosted by TV educationalist Fred Harris. In it he explains how to set up the system, and gives examples on how to use the supplied software. A booklet prepared in conjunction with *The Observer* newspaper entitled 'Your child and the National Curriculum' is also supplied.

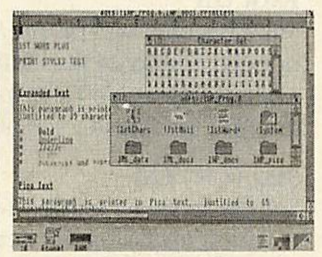
Two variants of The Learning Curve are available. The first with 14in colour monitor and stand costs £949 (ex VAT). The second at £699 (ex VAT) does not include monitor or stand, and requires a TV with a SCART connector. Both packages represent a saving of around £300.

Acorn is promoting The Learning Curve with a major press and TV campaign. Adverts are currently being shown on TV South, and national coverage will follow. 'A lot of effort has gone into putting this package together' said Bob Coates, Acorn's Consumer Sales and Marketing Manager. The package has been devised with the co-operation of parents, educationalists, headmasters and market research.



According to Coates, The Learning Curve 'is an attempt to take Acorn back into the home market in a big way'. Acorn is on (0223) 245200.

● A competition where you can win The Learning Curve (complete with monitor and stand) will appear in the June issue of *BBC Acorn User*.





First Word Plus and Genesis come with The Learning Curve

NEW MD AT ACORN COMPUTERS



Acorn Computers has recently undergone a top-level management reshuffle leading to the appointment of a new managing director.

The directors of Acorn Computer Group plc appointed Sam Wauchope as MD of Acorn Computers Ltd.

Wauchope has been with Acorn for five years, and has been promoted from sales and marketing director. His appointment follows the promotion of former MD Harvey Coleman, who takes up a new role as president and chief executive officer of Olivetti Systems and Networks Canada Ltd.

The position of Sales and Marketing director has been filled with the appointment of Michael O'Riordan, who was until recently marketing director of ITL.

Commenting on the changes, Alex Uboldi, Acorn's chairman, said that Coleman's promotion is recognition of the excellent results achieved by Acorn during the time he has been managing director.

In a speech to senior staff, Coleman announced that Acorn would enhance its activities in the home market, and that the company would be announcing a major new initiative to enhance its activities in that area.



Editor Geoff Bains. **Assistant Editor** Pauline McLernon. **Technical Editor** Robert Miller. **Education Editor** Lisa Hughes. **Editorial Assistant** Christina Neal. **News** David Janda. **Art Editor** Tim Harding. **Ad Manager** Roger Mullins. **Deputy Ad Manager** Duncan Pringle. **Sales Executives** Richard Power, Matthew Thistle. **Ad Production** Liz Walsh. **Production Manager** Jennifer Jeffrey. **Managing Editor** Ellen Brush. **Publisher** Seamus Geoghegan. **Publishing Director** Michael Potter. **Editorial Director** Christopher Ward.
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on

Sunday 22nd April 1990

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We have a very wide stock range, from computers, printers and software, right through to spare parts, such as keyboards and power supplies. All will be available on sale.

Beebug and RISC User Magazines
We also publish the acclaimed Beebug and RISC User magazines for the BBC Micro, Master and Archimedes/A3000 computers. Back issues will be available at special prices. The editorial team will be on-hand to discuss the magazines and their contents.

Beebug DTP
Ovation, the new **DTP** system for the Archimedes will be on demonstration, along with our **scanner, 5 1/4 disc buffer** and our new **memory upgrades** for the A3000.

Demonstrations
Our technical team will be present to demonstrate and discuss items of software and hardware that might be of interest to you.

Instant 0% Finance
Mercantile Credit will be attending so we can offer instant 0% Finance on all new Acorn Computers, enabling you to take your new computer away with you on the day.

Special Offers
Special reductions and clearance offers on a wide range of items with many available in our "£5 bargain bin".

HOW TO FIND BEEBUG
By Car - St Albans is easily reached from A1 A5 A6 M1 and M25.

By Train - We are 10 minutes walk from St Albans City Station on the King's Cross to Bedford line.

Companies represented include:

Acorn Computers
A number of Acorn staff will be on hand to demonstrate and discuss the complete range of computers including the A3000.

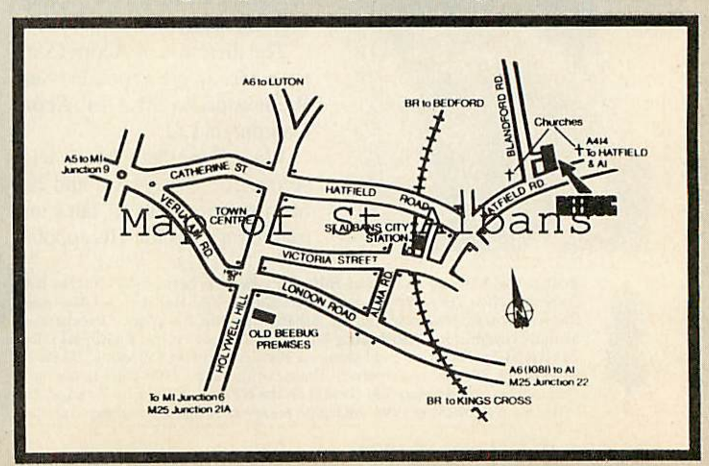
Colton Software
Pipedream 3, the efficient spreadsheet/ wordprocessor/ database for the Archimedes will be on demonstration together with View Professional for the BBC B and Master.

EMR Ltd
Mike Beecher will be attending to demonstrate the popular Studio 24 Plus MIDI Music package for the Archimedes as well as his range of MIDI add-ons for the BBC and Master series.

Star (UK) Ltd
See the business and professional range of Star printers in action including the new XB24-10 colour printer. The range of Star laser printers will also be on demonstration.

Fourth Dimension
Fourth Dimension will be demonstrating their excellent range of games for the BBC Micro and the Archimedes..

Events & visiting companies subject to change without notice.



32MB ARC APPLICATIONS

The first of a new range of aids from DT Software increases the apparent memory available for an Archimedes C application to 16 or 32Mbytes.

DT-VM uses virtual memory techniques to 'fool' the Archimedes into thinking that there is more memory in the machine. This is achieved by swapping sections of memory to and from hard disc.

The package, which costs only £7, is suitable for linking into programs developed with releases 2 and 3 of Acorn's ANSI C compiler. It will not work with existing applications. Information sheets are available from DT Software, 13 Northumberland Road, Leamington Spa, Warwickshire CV32 6HE.

CHEAP LASER

Crown Computer Products is currently selling what it claims to be the lowest cost laser printer on the market.

Due to its large purchasing power, Crown is offering a limited number of the Ricoh 4081 laser printer at £700 (ex VAT). The unit features eight page per minute output at 300x300 dpi resolution.

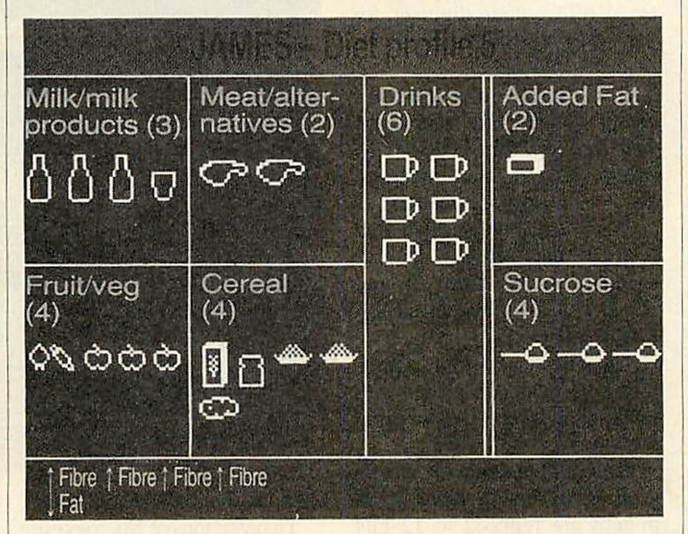


COMPACT ADAPTOR

Jafa Systems, manufacturer of the Romplus-144 sideways Rom board for the Electron has released a Master Compact cartridge adaptor.

It consists of a PCB which plugs into the side expansion connector and includes a switch to select between Master or Electron cartridges. The unit costs £25 inclusive of VAT. Jafa is on (0222) 887203.

HEALTHY BYTES FOR TODDLERS



The National Dairy Council has released a personal food and fitness profile program for use on the BBC model B and Master computers.

Healthy Bytes introduces pupils to the principles of healthy eating and physical activity, while emphasising the role that variety plays in the food we eat and the importance of dietary balance in ensuring good health.

The package has been designed by Dr Judi Buttriss, senior nutritionist at the Council, for use with children aged between nine and 13. It consists of a disc, a teacher's manual and worksheets for the pupils.

The package represents the Council's first venture into computer aided learning, and costs £12.50. The National Dairy Council can be contacted on 01-499 7822.

BARGAINS GALORE AT FAIR

A barrow-boys' computer exhibition to end them all is to be held between April 28-29 at the New Horticultural Hall.

The second All Formats Computer Fair, as the name suggests, caters for anyone interested in home computing at bargain prices. According to Marketing Consultant, Bruce Everiss, the first show in February attracted 'several thousand enthusiasts', hence the repeat performance.

Everiss can be contacted on (0926) 640137.



LASER DISC FROM SHELL

An interactive video project pack for use on the Domesday system has been released by Shell Education Services.

The pack is a spin-off from a laser disc system developed by Shell UK to provide route maps in filling stations. The disc provided with the pack contains thousands of national and local road maps for the UK. Of particular use in history, geography and economics, the software allows pupils to build their own databases.

At £160 (ex VAT) the pack comes with a booklet and sample programs to demonstrate the system in action. Users can also write their own demonstration systems with the software supplied. The video system is also available for Sony, Philips and Pioneer players.

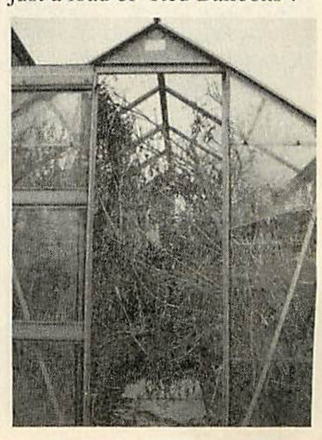
More information is available from James Arnott at Shell UK on 01-257 3152.

RED ALERT

The experimental project to increase tomato growth by playing sounds from an A3000, revealed in last month's End User, has suffered a terrible set-back.

After accidentally playing acid house music to the entire tomato plantation, the melon-sized fruit has shrivelled.

Well, all right, the story was nowt but an April fool and experimentalist Allen Broods is just a load of 'Red Balloons'.



NEWS IN BRIEF

● Citizen has introduced the first nine and 24-pin colour printer driver to ensure compatibility between Acorn Archimedes and Citizen colour printers.

The colour driver is available on disc for £10 and allows colour printing using any Citizen colour dot matrix printer including the Swift 24.

● Computer Concepts has decided to release an educational network version of *Impression* that does not require a dongle.

The networked protected version has been released as 'some schools are worried that the dongle may be stolen.' Computer Concepts is on (0442) 63933.

● Circle Software has adopted what it thinks is a unique system of protection for its Archimedes products. The system involves an embedded serial number. For the software to work a password is required. Circle Software is on (0793) 770021.

DIARY DATES

22 April. Beebug Spring Open Day. Contact: Beebug on (0727) 40303.

24-27 April. Which? Computer Show, National Exhibition Centre, Birmingham. Contact: Reed Exhibitions on 01-948 9800.

28-29 April. The First All Formats Computer Fair, New Horticultural Hall, Victoria, London. Contact: John Riding (0225) 447453.

9-11 July. Acorn Networks '90 – the fifth annual computer networking conference, Keele University, Staffordshire. Contact: Sarah Scott on (0223) 245200.

25-28 September. Business Computing '90, Earls Court, London. Business and trade exhibition only. Contact: Montbuild on 01-486 1951.

DIGITISE ON THE ARC

Image analysis specialist Digithurst Ltd has released a £495 (ex VAT) colour digitiser for the BBC A3000 and Archimedes 400 series.

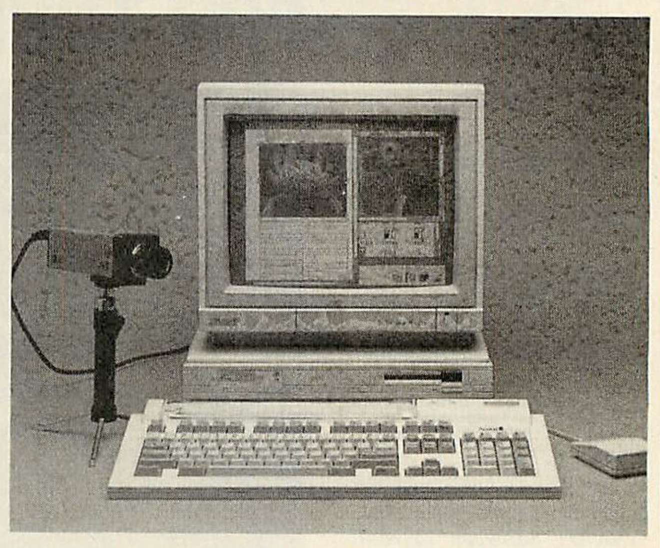
The package also includes utility software that runs on the Arc desktop. This allows the transfer of images to memory, disc, or to other applications.

Images may be scaled and clipped, and software controls for saturation, contrast and brightness of the captured image are provided.

The Microeye AI has a resolution of 640x256 pixels with 24 bits of colour information per pixel.

Data is available for image processing, but in sprite form images are reduced to 12 bits per pixel which gives an effective palette of 4096 colours.

In sprite form images can be transferred between applications



such as *Acorn DTP* and *Paint*.

Two versions of Microeye are available. A plug-in board with a back-panel that carries an input connector for RGB/Video is available for the 400 series.

For the A3000 the board is supplied mounted in a separate external box which plugs into the expansion connector.

Digithurst is on (0763) 242955.

ARC MEDICAL LAB

A computer-based teaching facility has been opened at Newcastle University's Medical and Dental School.

The large multi-disciplinary laboratory has recently installed an additional 16 Archimedes 410 computers.

This brings the total number of Arcs at the laboratory up to 25. All the computers are connected together by an Econet network that stretches over one kilometre.

The Acorn systems provide a fully integrated solution for the acquisition, display and analysis of experimental data using a wide variety of standard software and also software developed in-house.

For more information on the university's setup contact Dr Gary Green on 091-222 6000.



FONTASTIC NEWS

Ian Copestake Software and the Electronic Font Foundry have each released a new collection of quality fonts especially designed for the Archimedes range of computers.

Over 100 outline fonts are available at an average of £5 per font. Copestake is offering a price reduction if fonts are purchased with either the Acorn *DTP* package, *Impression* or *Pipedream 3*.

Ian Copestake Software is on 051-648 6287; EFF can be contacted on (0990) 28698.

● Beebug is also supplying outline fonts. A pack containing 13 outline fonts, each with 190 characters is supplied together with a 'PSprolog' file which allows the new typefaces to be printed on Postscript printers.

Outline Font Pack 1 costs £54.50 (inc VAT), and is the first in a series. Beebug is on (0727) 40303.



ON LINE FANTASY

In the days of yore, when people thought 1200/75 baud comms was fast, bulletin boards tended to be used by people who wished to talk about computers and nothing else.

Time has moved on and throughout the country there are informal 'networks' of bulletin boards which cater for different needs. One such network mentioned in this column before is the Channel-X network. This specialises in computer music.

A letter from Peter Wainwright, who uses the name Pandrogas (please don't laugh!) informs me that the Shatternet network specializes in science fiction and fantasy.

Pete, er... Pandrogas, runs a BB in Northampton called Darkhaven Castle. The board is used as the HQ for the Shatternet network which consists of 17 boards, three of which are currently off line.

The majority of the boards are run on BBC B or Master 128's using the *CARBBS* BB software created by Chris Royle of the Sin Bin. Most provide scrolling and viewdata access, and a network mailing system is currently being developed.

The network also provides a fair bit of support for the Archimedes and Darkhaven Castle features a news bulletin for both the Beeb and Arc.



Even I must admit that comms can be boring now and then. If you're thinking of a career in comms, think again. I mean, look at the bods above. They look bored stiff operating an on-line system. The one on the left is scratching his face, and the dude second from left has resorted to picking his nose! As for the other three suit-types, I know a promotional job when I see one.

WINNER

Remember the competition I set in the March issue? The idea was to submit a caption to the picture on the right.



At least a dozen of you sent in suggestions. A few were naff, a couple were imaginative and some were downright sexist (E Wayers take note). After much deliberation I decided that M T Gibbs of Kempston, Beds is the winner with 'No officer, it's not a carphone. It's Victor Kiam's new gadget for removing hair from my ears.' The editor liked that one as he's got the very same gizmo!

A copy of *The Complete Computer Virus* handbook is on its way – congratulations!

NAME	NUMBER	TYPE	TIMES
Darkhaven Castle	(0604) 413716	BOTH	24HR *
Greystar Isle	(0387) 51737	BOTH	24HR *
TAS/Diamond Plateau	(0372) 743809	BOTH	24HR *
The Owl Service	(0532) 605876	SCROL	24HR
Blackstone Keep	(0727) 56939	VDATA	OFF-LINE *
Sin Bin/?	(0532) 661536	BOTH	24HR *
Xoth (Chton's Lair)	(0532) 483563	VDATA	OFF-LINE *
Byte Back!	01-959 8105	SCROL	24HR *
Transylvania Expr.	(0274) 621668	SCROL	24HR
Optix/Tamboryon	(0482) 872294	SCROL	OFF-LINE
Resolve	(0582) 832653	BOTH	24HR *
Phase II	01-330 7738	VDATA	24HR *
The Red Dwarf	(0604) 705744	SCROL	24HR
Beyond Belief	(0642) 787898	VDATA	24HR *
Swafax 2000	(0622) 850788	VDATA	24HR *
Cyclone	(0603) 260973	BOTH	24HR *

* BBC model B or Master 128 systems

Why not give one of the Shatternet boards a call?

BAD NEWS

Last month in News In Brief I reported that Michael Colvin, Tory MP for Romsey and Waterside, had submitted a Private Member's Bill proposing tough sentences for computer hackers.

The bad news is that the Bill got a second reading in the Commons, and it looks like it could become law!

More news next month but in the meantime protest to your MPs (as well as Colvin) and tell them why such a bill is ridiculous.

David Janda

NEWS IN BRIEF

A number of BB operators have asked if they can set up a *BBC Acorn User* area on their BB in which they would provide program listings from the magazine.

Sorry folks but no can do. All *BAU* programs are copyright unless (occasionally) stated otherwise. Also, as well as yellow pages, *BAU* programs are sold on disc.

● Dialcom is no more. No, not the company which operates services such as Prestel, Telecom Gold and PSS, but the name. For some silly legal reason us hacks must use 'a service from British Telecom' instead. Dialcom House, in Hemel Hempstead (aka The Twilight Zone) has been renamed Network House.

● I have mentioned the Kermit file transfer protocol in these pages a few times and a number of you would like to know where you can get it from.

Acorn has a version for the Arc and Beeb owners can obtain an excellent version from the public domain library at Lancaster University. To access, call the university computer on (0524) 67671 (various speeds). Enter CALL LANC.PDSOFT at the chevron. Then enter (in lower case) *pdsoft* when asked for sign-on and password.

● Microlink on the Istel network has launched Bloodstone, a long-awaited multi-user game.

It's free to peak time players and 3p per minute off-peak. For more info contact Microlink on (0527) 28515 ext 2697.

If you have any comms news please send it to David Janda at BBC Acorn User *or contact him on Telecom Gold 81:RED001 or via Prestel 919992492.*



ON THE CREST OF A WAVE

As promised in the last Music column, you'll find a short program in this month's yellow pages which plays samples through Hybrid Technology's Music 5000.

The program accesses the DAC (Digital to Analogue Converter) directly so it's not even essential to have the Ample Nucleus Rom in your computer.

The program generates a variety of waveforms by calculation and sends them to the DAC. What would be even more interesting, however, would be the ability to load and play 'proper' samples.

The problem here is getting samples into memory in the first place as I am not aware of any sampler programs for the BBC micro. But if you have an Archimedes, a Beeb and suitable communication software, you should be able to transfer sample data from the Arc to the Beeb.

This is something I haven't tried yet but if any enterprising reader wants to pursue this avenue of exploration, let us know your results – good or bad.

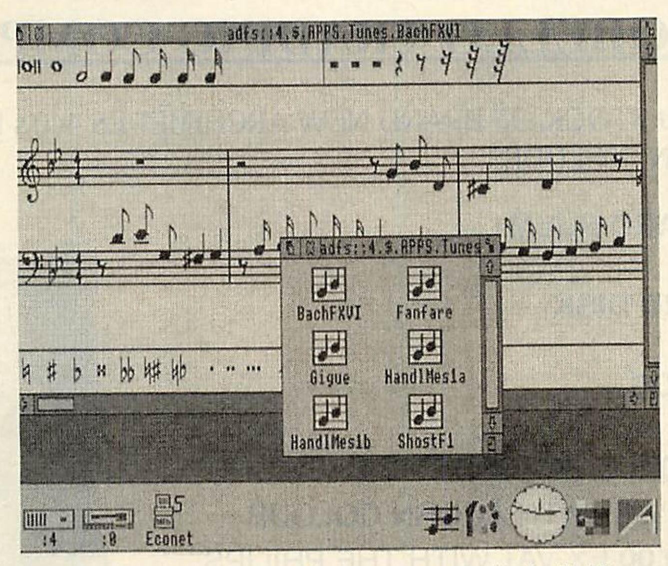
Samples give us more realistic sounds than most forms of synthesis. One of the most critical factors in achieving this realism is the initial attack portion of the sound.

This is why many modern forms of synthesis (such as Roland's LA synthesis used in its D-50, MT-32 and D-110 synthesisers) use a sampled waveform of the attack portion of a sound followed by a synthesised waveform for the body of the sound.

We can demonstrate the importance of the initial attack period with the Hybrid Music System as some of the waveforms it uses are pseudo samples. GET the Vibglock sound into Notepad.

The attack is provided on channel two by the high waveform. Reduce its AMP to 0 (press f1 then RETURN) to hear the sound without it – interesting, eh? If you like experimenting with waveforms, Amplinex disc 14 contains a utility which lets you redefine any or all of the Music 5000's waveforms.

If you're not an Amplinex member, send a fiver plus a formatted disc and an SAE to Amplinex, 26 Arbor Lane, Winnersh, Berks, RG11 5JD.



Maestro, the music program that comes as standard with Risc OS, makes getting to know MIDI on the Arc easy – and cheap.

MAESTRO AND MIDI

Did you know *Maestro*, the music program supplied with Risc OS, is MIDI-compatible? If you have a MIDI interface, when you access the Instruments menu in *Maestro*, you will see a fourth column labelled MIDI.

The program interrogates your system and the MIDI column only appears if a MIDI interface is present.

That makes *Maestro* the cheapest introduction to MIDI on the Arc – free! All you need is the interface.

Maestro's MIDI parameters are used to select which MIDI channels the eight voices will transmit on.

You need a multi-timbral instrument (one which can play different music lines using different sounds) to take full advantage of this.

Most modern synths and expanders are multi-timbral.

If you have a MIDI podule, enter Command Line mode by pressing f12 and type *HELP MIDI; you will see a list of MIDI commands.

The MidiSound channels MIDI data to the internal voices and specifies the MIDI port, MidiTouch enables and disables velocity data, MidiChannel sets the MIDI channel 1-16, MidiMode selects MIDI mode 1-4 and MidiStart, MidiContinue and MidiStop control the transmission of MIDI clock messages for controlling drum machines and sequencers.

This also shows the version number of the MIDI podule software (to work with the forthcoming *!Inspiration* you need version 3.14 or later).

I haven't seen these commands fully documented anywhere but entering *HELP <command> gives more information which will be self-explanatory if you know a little about MIDI.

Ian Waugh

NEWS IN BRIEF

● At last. *!Inspiration*, the professional MIDI sequencing program for the Arc, is finished and due to be launched on 1st March at £399 plus VAT.

A demo disc is available from Pandora. Send a formatted disc plus a stamped, addressed padded bag. You don't need a MIDI interface to run the demo.

Pandora is due to launch the PM4 professional MIDI Interface, which is compatible with the A3000, at the same time.

Further details from Pandora Technology, 9 St Marks Place, London, W11 1NS. Tel: 01-221 9653.

● Archimedes music specialist, Ampsound, has developed a 1Mb expansion card for the A3000.

Normal retail price is £172.50 but you can save £45 by buying an A3000 plus the board for £874. Ampsound, 153a Victoria Street, St Albans, Herts, AL1 3TA. Tel: (0727) 50075.

● NCET has produced a version of *Touching Sound*, which runs on the Hybrid Music System without the copyright problems which have delayed its release so far. It's priced at £15.

Telephone (0203) 416994 for details.

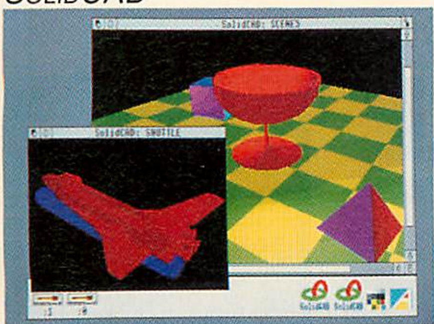
● Schools with B, B+ and Master computers will be interested in *Opus* from the Advisory Unit. The package is designed for introducing and exploring the way music is put together. *Opus* costs £15 from the Advisory Unit, Endymion Road, Hatfield, Herts AL10 8AU.

● If you have any music news or tips you'd like to share or if there are any topics you'd like to see covered in this column please write to Ian Waugh at *BBC Acorn User*, 20-26 Brunswick Place, London N1 6DJ.

SILICON VISION

SOFTWARE FOR THE ARCHIMEDES COMPUTER SYSTEM

SolidCAD



The next generation multi-tasking CAD package combining 2D Draughting and 3D Modelling techniques with advanced smooth shading and lighting effects to provide the ultimate 3D Draughting System for Architectural design, Interior design, Engineering design and Teaching CDT. Allows drawing in plan, front & side elevations and also directly in 3D to visualise a model while it is being created. Powerful zoom, pan, sweep, extrude and macro facilities are also provided to enhance design productivity.

£99.95 (ARC) New

SolidsRENDER

The most advanced Ray Tracing package for the Archimedes producing photo-realistic images of SolidCAD designs or FILM-Maker animations taking into account multiple light sources, reflections, shadows, transparencies, refractions and textures for the highest quality pictures from the leading 3D graphics experts renowned for technical excellence. The high-speed ray tracer uses sophisticated colour mixing techniques to provide the maximum range of colour shades plus anti-aliasing for smooth edges, motion blur effects, dynamic viewpoint, variable camera lens for wide angle and telephoto effects and multi-colour light sources driving the Archimedes display hardware to its limits for the best photo-realistic images within the laws of optical physics.

£79.95 (ARC) New

SolidTOOLS

The fully integrated environment for 3D CAD, Animation, Rendering & Hardcopy. The package includes SolidCAD, FILM-Maker, SolidsRENDER, Realtime Graphics Language, SuperDump & SuperPlot for a turnkey solution satisfying all your 3D Design and Presentation requirements.

£275.00 (ARC) New

RiscBASIC



The best BASIC V compiler money can buy. Here's what the reviewers say:

"If you are looking for THE compiler to go for, and are confused about which one deserves to win the very public battle that has been raging in the advertisements, well my preference is for RiscBASIC"
- RISC USER August 1989.

"In summary, BASIC V is the best version of BASIC produced and RiscBASIC provides the most compatible, fastest compiler for this language. This will be an invaluable addition to every serious BASIC programmer's toolkit. My congratulations to Silicon Vision" - Archive June 1989.

"very useful indeed for development work...produced significantly more efficient code" - Micro User July 1989.

"RiscBASIC wins the race...has the edge overall...more likely to provide the correct results" - BBC Acorn User Nov 1989.

"Still the only true BASIC V syntax compiler. If you want the best, buy Silicon Vision's complete answer"
- Micronet August 1989.

£99.95 (ARC) New

GerberPlot

The complete Gerber driver for ARC-PCB and ARC-PCB Professional Printed Circuit Board design packages producing Gerber plotfiles for driving Electro-static Photo-plotters. These plotfiles may be sent directly to photoplotter bureaus on Archimedes ADFS or MSDOS disc formats to produce the highest quality PCB artwork for professional results.

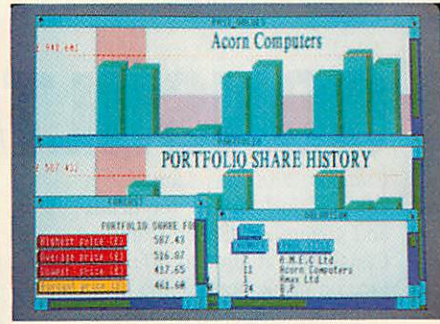
£125.00 (ARC) New

SuperPlot

The complete plotter driver for SolidCAD, Realtime Solids Modeller and Gate-Array Design System supporting the industry standard HP-GL, Graphtec, Watanabe and Plotmate plotters.

£29.95 (ARC) New

ShareHolder



The complete share holder's management system providing all the facilities needed to automate your portfolio. Features include Company statistics, Share holdings, Transaction processing, Portfolio history, Forecasts, Dividends due, Share price updates plus built-in Calendar, Calculator and Hardcopy facilities for total integration.

£99.95 (ARC) New

DataVision

A full featured relational database management system which also includes word processing, label printing, reporting, & mail-merging facilities in one integrated environment for the Archimedes, bringing professional quality business software to the demanding user. The database manager is rich in features and includes facilities for the production of complex queries, detailed reports, browsing, sophisticated relational data entry, relational reporting, interactive & global editing, formula entry and validation. All this in an intuitive easy to use mouse driven environment.

£99.95 (ARC) New

Financial Accountant

The professional business accounting and database package which includes DataVision together with turnkey applications for Order Processing, Invoicing, Sales ledger, Purchase ledger, Cash book, Stock management, Reporting, VAT returns plus year-end accounting complete in one integrated environment.

£175.00 (ARC) New

OfficeTools

The complete Office Automation system for Database management, Mail merging, Wordprocessing, Label printing, Order Processing, Invoicing, Accounting, Share portfolio, Forecasting, Dividends processing, Calendar, Calculator and Presentation graphics. Includes Financial Accountant, DataVision, ShareHolder, and the Presentation System providing a turnkey solution for all your business and management requirements.

£295.00 (ARC) New

All software run in native mode on A300-400 Series & A3000 with RISC OS. Enquire for our free product Catalogue

SILICON VISION LTD, SIGNAL HOUSE, LYON ROAD, HARROW MIDDLESEX HA1 2AG. TEL: 01-422 2274 or 01-861 2173 FAX: 01-427 5169. TELEX: 918266 SIGNAL G.

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All prices include VAT and Carriage (Overseas orders should add £4)



CONSULTANT ON CALL

Campus 2000 has launched a new on-line service for heads and governors. Called Campus Consultant, it aims to offer advice on implementing the Education Reform Act, in particular LMS.

Regularly updated and managed by Innovations International, a team of educationalists headed up by Kingshurst CTC principal Valerie Bragg, Campus Consultant will also provide a confidential consultancy service for answering personal queries on management issues. All questions, submitted, of course, via electronic mail, will receive a reply within 48 hours.

Innovations International is fielding an impressive array of experts but as some of the answers it will be giving will hinge on interpretation of the law, it has taken out substantial indemnity insurance.

Subscribers will also be able to use the system's conferencing facilities to discuss mutual problems. They will also have access to summaries of key DES circulars and case studies.

The cost of a subscription will be £150,which buys unlimited use of the Campus Consultant information services plus a thousand 'question units'. It's estimated that an average question will 'cost' 25 units.

Further information about Campus Consultant is available from Campus 2000, PO Box 7, 214 Gray's Inn Road, London WC1X 8EZ.



How does she manage it? Valerie Bragg combines her duties at Birmingham's Kingshurst CTC with directing educational consultancy Innovations International, the company running Campus Consultant. Herself a shining example of 'coping' with the new service she may be able to help fellow heads handle the current educational reforms and avoid nervous breakdowns.

PRE-EMPTED

On show for the first time at the Archimedes Spring Fair in March, was the *Pre-Emptor* system, from a new company called, well, Pre-Emptor.

Company founder Brian Wright has spent 10 years researching and developing the software which, if it does as much as it appears to on a brief demonstration, could be an extremely powerful classroom and teaching aid.

Designed, as the slogan says, to 'free you to teach', the system has three basic aspects: assignment generation, record-keeping and report writing.

Teachers enter their pupils' details and assess their abilities. The program will then create worksheets for a variety of projects, specially tailored to meet individual pupils' needs and closely related to National Curriculum attainment targets.

The teacher enters students' marks perhaps once a month and at more or less the touch of a button can print out formative, summative or parental reports.

At present the attainment target modules all relate to the science National Curriculum, but Brian already has specialists working on modules for other subject areas and primary level.

The framework package costs £99.95 and each module is £24.95. Initial topics include the nature of science, sound and music and electromagnetic radiation. It runs best on the Arc but a version is also available for the BBC.

Mr Williams, network manager at Clapton School in east London and a visitor to the Spring Fair, was the lucky winner of a complete *Pre-Emptor* system plus attainment module of his choice.

Brian Wright can be contacted at Pre-Emptor, 2 Lockyer Road, Mannamead, Plymouth.

PRIMARY CASH BONUS

Schools minister Alan Howarth has promised extra DES money for hardware in primary schools.

Speaking at the annual conference of the National Assocation of Advisers for Computers in Education (NAACE) in Dorset, Mr Howarth said, 'I am very pleased to announce an addition of £4 million of supported expenditure to this year's Education Support Grant programme of IT in schools. The extra grant is exclusively for the purchase of microcomputers for primary schools.'

He said that the UK leads the world on IT in schools and thanked LEAs and teachers for helping to achieve this. According to official DES statistics there are on average three micros in every primary school (1:67 students) and 30 in every secondary school (1:28).

Lisa Hughes

NEWS IN BRIEF

● Glasgow-based publisher Scetlander has announced cuts in the educational prices of some of its most popular packages. *Add/Sub Maths* and *Holiday* are both down to £15 from £25 and £18.50 respectively, while *Colour* is reduced from £15 to £7.50. All three are for BBC machines.

The company has also published its new catalogue which contains details of 56 programs covering a wide range of subjects and ability levels. The catalogue is free from Scetlander Ltd, 74 Victoria Crescent Road, Glasgow G12 9JN.

● There are now just over 200 advisory teachers registered with Sherston Software's service for advisory teachers.

Under the scheme advisory teachers can have up to 10 titles on extended loan for use in their work with schools. They then have the option of a 50 per cent discount on any packages purchased for demonstration purposes.

Sherston will also make bulk loans for courses and INSET days.

Anyone interested in joining the scheme should contact Gill Sparrow at Sherston Software, Swan Barton, Sherston, Malmesbury, Wiltshire SN16 0LH.

● Mercury Educational, which handles ITV Schools' products, has a series of cross-curricular packs featuring five new pieces of software and called IT.

Programs include a spreadsheet, a desktop publisher, a profiling and matching program, an accounts package and a bookings and reservations program.

Mercury has an up-to-date catalogue available from 8-10 Lower James Street, London W1R 3PL.

New from Acorn

THE LEARNING CURVE



THE LEARNING CURVE

NEW - FROM ACORN

It consists of:

An A3000 Computer
The new faster PC Emulator
First Word Plus v2 Word Processor
Genesis Information System
A Video explaining how to use the package
Information on the National Curriculum

Save Over £240

The free software bundled with this package is worth £300, and yet the entire system costs only £57.50 more than the standard A3000.

Ideal For Home & Education

This system is tailor-made for the home user with children. The A3000 and other Archimedes systems are increasingly used in schools and this all-inclusive package with the excellent Genesis software will supplement Information Technology in the National Curriculum.

Just Right for Home & Business

A Word Processor is essential in all home systems, and 1st Word Plus with its built-in spelling checker is excellent. The new PC Emulator also means that over 95% of PC software (DBase, Lotus, Wordstar etc.) will run on the A3000 straight away.

RISC User

RISC User is the world's largest Archimedes Support Group, and publishes the leading magazine devoted exclusively to the A3000 and Archimedes. An annual subscription is **£16.90 (UK)** and carries a multitude of benefits, including FREE technical support and discounts.

SPECIAL OFFERS FOR RISC USER MEMBERS

0% Finance

We are able to offer RISC User members 0% finance over 9 months, for example:

	COST	DEPOSIT	BALANCE	MONTHLY PAYMENTS
Learning Curve Computer only	£803.85	£83.85	£720	£80
Learning Curve Comp + Colour Monitor	£1021.20	£121.20	£900	£100

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Learning Curve Computers are in short supply - order yours now and we will supply on a first-come first-served basis.
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Please supply: **Learning Curve Computer Only** (£803.85) ☐
Learning Curve Colour System (£1021.20) ☐
Information about the Learning Curve System ☐
A RISC User Subscription (£16.90 UK) ☐
0% Finance application form for: the Computer only ☐
the Colour System ☐

I enclose a cheque for £________ *(Please add £7 for courier delivery)*

Or: Please debit my Access/Visa/Connect Card No____/____/____/____/

Card Expiry Date ___/___/ Signature ______________

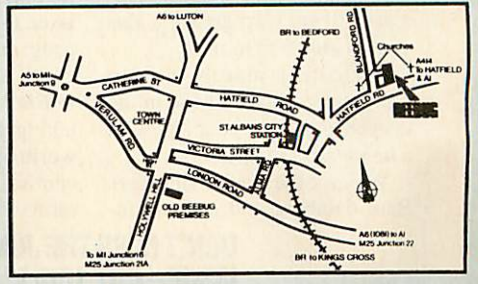
Name ______________ RISC User/BEEBUG Memb No:__________

Address ______________________

______________________ Post Code ______________ A5

HOW TO FIND BEEBUG

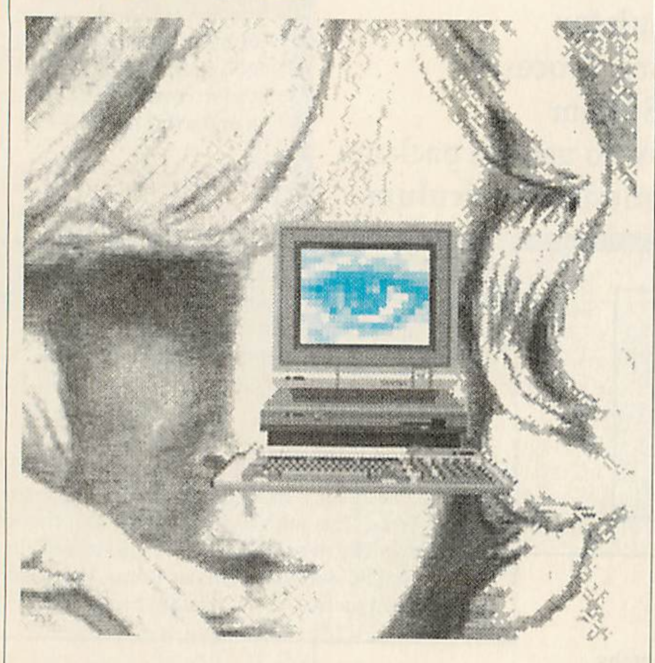
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NEXT MONTH Coming soon to BAU...

THE RIGHT IMAGE



In the June issue of *BBC Acorn User*, you will have the chance to win Acorn's complete new home learning system, The Learning Curve. See the exclusive report on page 7.

You can also read what Acorn's plans for IT in education are... plus what some schools are doing with simulation software.

The issue also sees the start of a major new series on image generation and manipulation.

If you've ever wanted to get your computer to analyse a video picture or you've always wanted to create those wacky effects the professionals manage, on your own artwork, this series is the one to read.

Also next month, we go searching for the lost file in the deepest depths of your Arc with a handy disc manager.

We give the Beeb a sideways Ram database and take an in-depth look at Roman numerals. Plus we examine the impressive *Genesis* hypermedia program, Sherston's newsroom simulation for the Beeb, the innovative *Arcol* graphics package, Qume's new WP+ laser printer, the long-standing *Pixel Perfect* Arc DTP software. Plus what you can add to your Archimedes for next to nothing.

And the June issue sees the start of a brand new regular column for users of the Master 512 and the Archimedes PC emulator.

Plus there's all the usual favourites to pack the June issue to the gills with advice, programs and features for every Acorn user.

● *BBC Acorn User* will be taking a special look at the world of 8-bit machines in the coming months. Watch out for more details.

DON'T MISS THE JUNE ISSUE – OUT 10th MAY

Send letters to BAU, 20-26 Brunswick Place, London N1 6DJ **LETTERS**



ASSAULT AND BATTERY

I feel it necessary to comment on the 'Master Battery Tip' in Eight Bits in the April issue.

Under no circumstances does Acorn recommend replacing the Master 128 battery pack by individual cells, even with a diode. The complete pack should be replaced by the Acorn spare, ADT16, available from dealers.

The use of the correct spare avoids the risk of batteries receiving a charging current from the computer.

David Bell
Acorn Computers

While we wholeheartedly agree that any readers not 100 per cent sure what they are doing should not attempt replacing the 'official' battery pack, the Acorn ADT16 battery pack is just individual cells and a diode as specified in the published tip.

Perhaps Acorn could look at supplying a battery pack made up from a battery holder as suggested in the published tip so Master owners could simply slip in new batteries when necessary, for about £2 a time.



A SCANNER CLEARLY

I read your January review of scanners and thought you might like to see what the Archimedes can really do with the right equipment – an Epson colour scanner and Kiwi software.

Lyndon McEntee
Gore, New Zealand

ENGLISH MADE EASY

I would very much like to thank C Ferrington for the brilliant printer driver for *View* which I now use exclusively. My Citizen LSP-10 printer is set up for Epson FX1 mode with the USA character set. I changed 'pound_char' to 35, but it was a nuisance having to change the dip-switch to English characters for wordprocessing or issuing an embedded command for every document requiring a '£' sign.

The answer was a short routine that was accessed every time the driver encountered Ascii character 96.

```
 10 REM View £ code
 20 REM for Epson compatible printers
 30 :
 40 oscli=&FFF7:oswrch=&FFEE
 50 pronly=&40D0:return=&044D
 60 PROCprint_pound
 70 PROCsave
 80 END
 90 :
100 DEF PROCprint_pound
110 P%=&C6A
120 [OPT 3:LDA #27
130 JSR pronly:LDA #82
140 JSR pronly:LDA #3
150 JSR pronly:LDA #35
160 JSR oswrch:LDA #27
170 JSR pronly:LDA #82
180 JSR pronly:LDA #0
190 JSR pronly:JMP return
200 .end_code
210 ]
220 ENDPROC
230 :
240 DEF PROCsave
250 N$="SAVE :0.!pound C6A"+STR$~(end_code)
260 PRINT'N$':OSCLI N$
```

The code changes the printer to the English character set, prints a '£' character, then reverts the printer back to the USA character set.

When the listing is run, the code is assembled and then saved as '!pound' which should be *LOADed just before '!codes' in the !BOOT file. The main DRIVER program (listing 1) also needs line 880 changing to read JMP & 0C6A.

E Ellis
W Yorkshire

INDEXING BAU?

I am an avid reader of *BBC Acorn User* and regularly refer to software and hardware reviews and read the feature articles with great interest. I am sure there are many readers like me who would welcome some form of volume index or a database to facilitate easy access to all this vital information.

Do you have any plans to provide such a service or do you know of anyone operating a scheme similar to *McHugh Enterprise Magazine Bibliography* which covers the computing press? Does this still exist?

Matthew Basford
Tunbridge Wells

A full index takes a great deal of work to compile and also takes up much needed space in the magazine.

We would therefore like to hear from anyone who has taken the time to write their own list. We're not sure if Mr McHugh still operates his service. If you're still out there Mr McHugh, please contact us and let us know!



LEST WE FORGET...

Although I am a keen reader of *BAU*, I still find it necessary to write to you about the ever decreasing coverage of the Electron, BBC B, Master and Compact; really anything but the Archimedes.

While I appreciate this is a new machine and probably deserves coverage, I don't think that the other machines should be ignored completely.

The advertising also seems to be going the same way, as does the news.

C Hartland-Swann
Northants

The deciding factor on Archimedes coverage is the current market, which is reflected by the advertising. We still cater for all the machines you mention.

The May issue has a roughly half and half 8-bit/32-bit content to keep everybody happy. Last month's issue also contained an extensive feature about Electron-associated hardware and software.

The Archimedes is the new machine at the moment and we have to keep up with the times. The Beeb though has not been forgotten, and we have an extensive list of 8-bit features coming up in the following months.

PASCAL, PLEASE

I'm doing a course on computers at College, and will be learning Pascal. I would very much like to do some work on my BBC Master 128 at home. Is that possible? Are there versions of Pascal available for the Master? I don't mind upgrading if that is necessary.

A Smith
Wolverhampton

If you wish to use a BBC micro to learn Pascal you should either consider Acornsoft's ISO Pascal or Oxford Computer System's Oxford Pascal. Incidentally the BBC Rom version of ISO Pascal works fine under the Archimedes 6502 emulator.

The compilation time is, however, a little slower than on the BBC. If you have access to a BBC Master with a 80186 second processor (the 512 board) the TDI's UCSD P-Pascal or Borland's Turbo Pascal are also recommended.

I would recommend you contact Advantage at 56 Bath Road, Cheltenham, GL50 7HJ — one of the biggest and most reliable shareware companies — it will certainly have some cheap Pascal packages available. The other upgrade path is to the Archimedes or the BBC A3000.

Here you will find Acorn's ISO Pascal to be a full and extended Level 1 implementation of the language. Another possibility for the Archimedes is the recently released Cambridge Pascal from Dabs Press.

New Outline Fonts for the Archimedes



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QUESTIONS AND ANSWERS

Q I've just been given a disc drive for my BBC micro by a friend. Unfortunately he made some modifications to the original drive concerning the links and the cabling.

Together we think we have returned things to normal, but before I start using it in earnest I am anxious to check the drive loads, saves, reads and writes data properly.

I don't want to go to the expense of taking my 'new' drive to a dealer for a service check. So can you recommend any programs that I could run on my system to check everything is functioning properly?

A You need a 'disc drive soak test' program but this is missing from disc doctor or disc utility packages. There is one in Michael Coleman's book *Disk Programming Techniques for the BBC microcomputer* published by Prentice Hall. It's called *Soak* and is ideal for testing suspect drives. The program will force a suspect drive to carry out repeatedly those operations which are likely to lead to the corruption of the disc's formatting.

If your drive completes the test you should have nothing to worry about.

Q A colleague of mine uses *Wordwise Plus* and has no trouble in printing multiple copies of a document.

I would very much like to do this using *View* or *View Professional*. I have read the manual and can find nothing to help.

A There is no simple solution to solving your problem as there is with *Wordwise Plus*, where you can write a segment program to produce multiple copies. But there are some possibilities. In both *View* and *View Professional*, you could program one of the function keys to carry out an individual PRINT and then you merely press that programmed function key again and another print is carried out for you – but that hardly automates the printing process!

It is also possible to produce multiple copies of documents by using the *View* macro facilities. In this case, your document would have to be the macro with the DM (define macro) stored command at the start of the document and named say <AA>. You would then place the stored command EM (end macro) at the end of the document. Also place a PE (page eject) command just before the EM to ensure a page eject at the end of the document.

With your document set up as a macro you merely call it and you should be able to print multiple copies. If you are unclear about the concept of macros, *A Dabhand Guide to View* from Dabs Press gives a good introduction.

Q At work they have a 'spare' IBM colour monitor. Can this be used with my BBC Master 512, which at present has a green screen monitor?

A You will certainly be able to use the IBM monitor with your BBC micro as it is broadly compatible with the RGB colour input that the BBC Master expects. However, you should not expect it to function as an IBM style monitor when you are using the Master with the 80186 co-processor active.

The IBM monitor will function as any BBC colour monitor. Rather than hunt for a suitable 9-pin D female to 6-pin DIN male, it will be relatively easy for you to change the connector to a BBC one.

Any IBM dealer will tell you the pin-out on the D connector and you should match this to the DIN by referring to the pin assignments shown on page 240 of the Master Welcome Guide.

The only problem will be in the connection of the intensity line which should be connected to either the +5v or the Ground. Try and see which gives you a suitable level of colour.

Q Help! I am experiencing some difficulties with the transfer of files between my Psion Organiser and my BBC Master. I've tried writing my own program but it is totally ineffective. Are you aware of any published software?

A You obviously missed the article in the May 1989 issue of *BBC Acorn User*. It was called Data Gets Going and was all about connecting up a Psion Organiser to a BBC computer

If you have a problem with an Acorn micro, commercial software or a program you are trying to write then *BBC Acorn User* can help. The Post A Problem service guarantees to give you a personal answer within 10 working days for just £4.

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and passing data between them. This will solve all your problems and you will be able to transfer data without any further trouble.

Q I have a BBC micro and recently it has been interfaced to a Panasonic KX-P4450 laser printer to produce text and graphics. Unfortunately the results of the graphics screen printouts are not as good as I was expecting.

A Due to the high resolution of the printout available from a laser printer it is inevitable that a BBC screen dump will appear to be 'chunky' on a laser printer. Some improvements can, however, be made.

Presumably, you are currently using your laser printer in the Epson emulation mode, and using a normal BBC screen dump. If this is the case, with a Rom like *Dumpout 3* from Watford you may be able to effect some improvements by altering the linear step in which the dots are printed horizontally and vertically.

With *Dumpout 3* this is achieved by altering a parameter of *GIMAGE. However, the best answer to your problem is to use the printer's built-in HP LaserJet emulation. The November 1988 issue of *Acorn User* contained a listing of a mode 1 dump.

Q I am looking for a wordprocessor I can use on my BBC Master 128 that allows me to produce text with at least 200 characters across the page. Is a package available?

A The traditional favourite wordprocessors for the BBC like *View* and *Wordwise* won't meet your requirements. *View* will print up to 132 characters a line, while *Wordwise Plus* can print up to 180. Probably the best bet would be *View Professional* marketed by Colton Software.

Another possibility is to use *Wordpower* from Ian Copestake Software, 10 Frost Drive, Wirral, Merseyside L61 4XL. This will manage 250 characters.

Q Is it possible to use hard disc drives made for an IBM PC or compatible with my Archimedes 410/1?

A Yes, it is possible to use hard discs produced for IBM PC or compatibles with the Archimedes 410/1. The computer comes with a hard disc interface built-in, so upgrading is easier than with an A310.

Q We have just purchased a secondhand BBC model B+ for our school and are experiencing considerable difficulty in using much of our original BBC model B software with the 'new' machine. We thought there was a high degree of compatibility between these machines. What has happened?

A The introduction of the BBC model B+ machine did start the issue of compatibility across the range of BBC computers. There were some software and hardware differences between the two machines – an additional 20K of shadow screen memory, 12K of sideways Ram and the 1770 disc interface replaced the 8271 interface.

This means, as you have found out, that a number of your original educational programs do not function or work differently. However, you say you cannot use most which seems far worse than it should be.

There should be few problems about Acorn's decision to change disc interfaces. The 1770 system is broadly compatible with the older 8271.

You may find that programs from 4Mation Software or Sherston, for example, do not run because of the way they have been protected. However, both these companies will happily provide replacement versions for around £4.

Also, some years ago Vine Micros of Marshborough, Sandwich, Kent (Tel: (0304) 812276) produced a package costing about £15 which allows the BBC B+ to function just like an ordinary model B.

ACORN CUSTOMER HOTLINE

Users of *First Word Plus* releases 1 and 2 who have an Epson LQ series printer with a cut sheet feeder may have experienced problems when printing documents of longer than a page in length.

This is easily cured by editing out the 'Vertical tab to line' option within the source (Hex) printer driver and then recreating the printer driver.

How to edit the source printer drivers and recreate them is documented in both the release 1 and 2 *First Word Plus* user guides but if you need more details, the Customer Services department has an application note available which covers the operation in more detail.

For a copy of this application note please send an A4 SAE to Customer Services at the Fulbourn Road address

● Some users have been experiencing problems driving the Qume Crystalprint Publisher from the parallel port of the Archimedes. Discussions with Qume have confirmed a problem existed in the firmware of the Qume CrystalPrint.

The problem has now been fixed and you can obtain a free upgrade of the firmware directly from Qume, Bridgewater Close, Reading, Berkshire RG3 1JT. Tel: (0734) 584646.

● As many of you will be aware, up until now the only way to obtain the Acorn Outline fonts and the Acorn Outline Font Manager was to purchase Acorn's *Desktop Publisher* package.

Acorn has now released the fonts on separate discs. The Font starter pack contains the Font Manager, and the Corpus, Trinity and Homerton Fonts. The NewHall Font is being released on another disc (along with the Font Manager).

The cost of these Font packs is £51.75. The product codes are SKF01 for the Font Starter pack and SKF02 for the NewHall Font Pack. Both products are available from your local Acorn Dealer.

● For people who wish to know more about the hardware of the A3000, Acorn has released the A3000 Technical Reference Manual containing details about the circuitry of the machine.

This manual will be particularly useful to people who wish to develop internal or external expansions for the A3000.

The manual contains details of the size the cards need to be and the connections to the expansion port. The manual is also supplied with circuit diagrams of the A3000.

The recommended retail price for the A3000 Technical Reference Manual is £29.95. The product code for the manual is AKJ75 and it is available from your local Acorn Dealer.

● Acorn's Support Information Database (SID) has proven to be very popular with Acorn users who have a modem. SID now has over 1600 regular users who are able to use all the facilities offered by the system.

Please remember that anyone who has a modem can use SID and have access to its many features such as sending technical enquiries to Acorn staff, leaving bulletins for other users to read and help with problems as well as download the vast amounts of software and textual information available for the Archimedes series, BBC A3000, BBC model B, B+ and Master 128.

Access can be gained to the system via Prestel by typing *SID# while online, using Fastrak or directly. For further information on SID please contact Customer Services.

Peter Dunn

Peter Dunn and the Acorn Customer Services Department can be contacted at Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge CB1 4JN.



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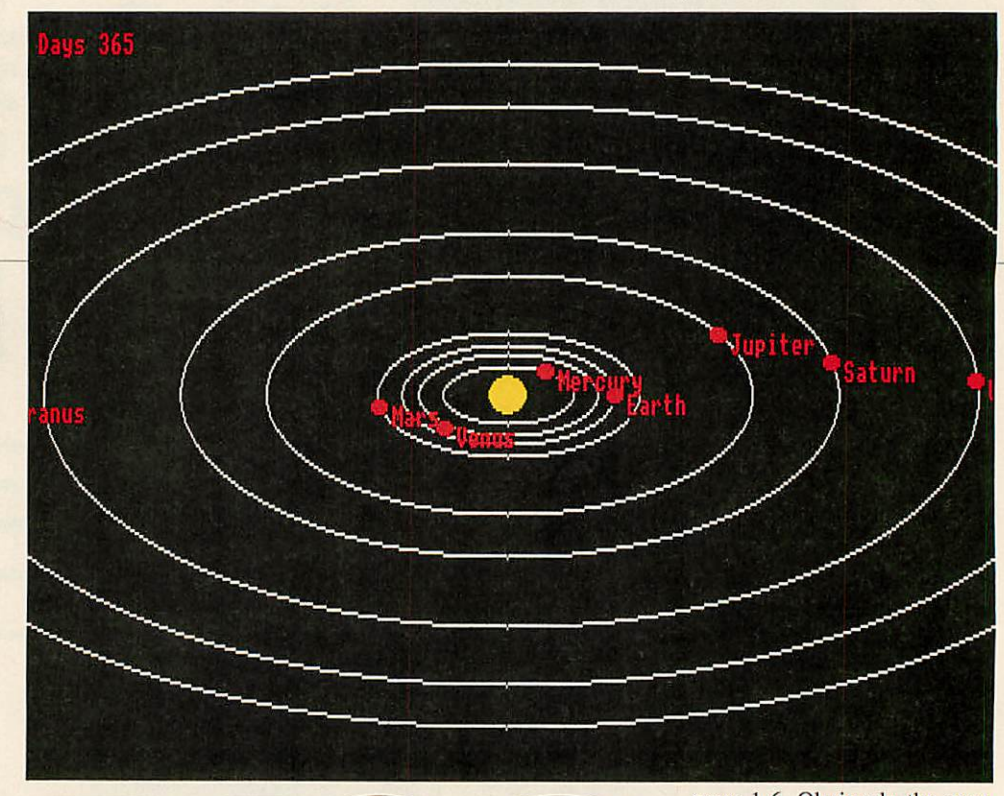
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RISC REVUE

In past Risc Revues we've delved into the depths of 3D drawing and surveyed the scope of scaled sprites.

Now, we proudly present a program that combines these two techniques.

It comes from Philip Armstrong of Leeds.

Philip noticed that in many new arcade games, scaled sprites are used to create the effect of three dimensions.

For example, a road sign in a driving simulation need only be defined once. Then, when plotted on the screen, it can be sized according to the car's distance from it.

On the Arc and BBC A3000, Risc OS makes sprite-scaling almost wickedly simple as Philip's listings illustrate.

Run listing 1 on the yellow pages. This creates a sprite of a shaded ball and saves it as a sprite file.

The program operates in mode 9 – a 16 colour mode. In fact, as Philip points out, any graphics mode could be used with any shaded sphere as a sprite, although mode 9 makes for speedier animation of the screen display.

The procedure PROCgreys sets the palette to a scale of grey shades. Sprite operations are performed in listing 1 in the yellow pages with SYS sp%... where sp% is the SWI number for "OS_SpriteOp" (that is, &2E).

SYS sp%,15,,"name",p,w,h,m creates a mode m sprite called 'name' of width w and height h. Palette data is included in the sprite's definition if p is 1; but this information is left out if p is 0. SYS sp%,29,,"name" creates a mask for a sprite.

The call SYS sp%,60,,"name" TO r0,r1,r2,r3 is new to Risc OS and diverts graphics operations to the sprite. In this way the sphere is actually drawn 'within' its sprite whereas, prior to Risc OS, the image would have had to be drawn on the screen and then 'grabbed'.

When the sprite file Ball9 has been created, run listing 2. A three dimensional pattern of spheres is shown. To rotate the image, move the mouse around. Hold down the left mouse button to 'zoom in' or the right button to 'pan out'.

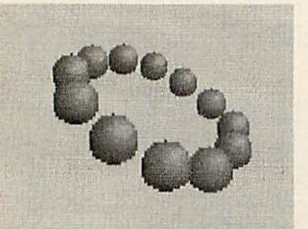
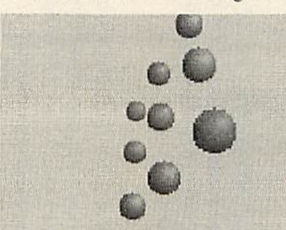
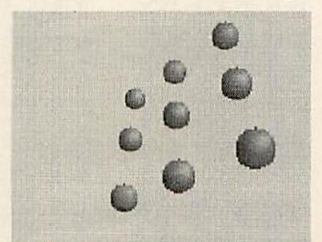
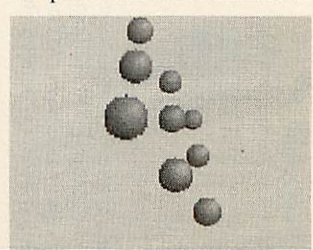
You may also use the cursor keys to move the image in the x and y directions. The time taken to show a single frame is displayed in the top left corner of the screen. Next to it is the shape number. To select a new shape press 1-6. Obviously the complexity of the shape determines the time taken to plot it. Not only must more sprites be plotted on the screen but the spheres must be sorted according to their depth so that the rearmost one can be plotted first.

PROCnew is responsible for setting up the x and y co-ordinates for the currently selected shape. Shapes 1-5 are defined by calling three special procedures – PROCplane, PROCdisc and PROCshapes.

Shape 6 is made up of points listed in the DATA statement at the end of the program and data is read in by PROCreaddata.

Simply replace these values with your own x, y and z co-ordinates to define your own shapes (remembering to increase the value of pnts% if necessary so the arrays defined are large enough).

The scaled sprite plotting is done with SYS "OS_SpriteOp",52 in PROCplot. In fact the SpriteOp number is 308 (that is, 52+256) because a user sprite area is used rather than the system area. The last parameter is the address of

Scaling 'spherical' sprites makes 3D graphics look simple. It's all trickery of course

a scale table. This scale table contains four values: xmult, ymult, xdiv and ydiv.

The sprite is plotted xmult/xdiv times actual size in the x direction and ymult/ydiv in the y.

SHORT SORT

After the piece about SYS "OS_HeapSort" in a recent Risc Revue I started to experiment with the good old QuickSort algorithm to see how fast an implementation could be written on the Arc.

The result is listing 3 which I don't claim to be the fastest thing I have ever written. Nevertheless it plods along at a pretty reasonable rate – sorting 100,000 randomly arranged integers into order in about 5.5 seconds.

Run listing 3 and specify how many integers you would like to sort. The random table is built up and then sorted.

The procedure PROCshow is used to show a selection of the sorted values. If you'd like to see them all (to prove it isn't cheating) type PROCshow(1).

Incidentally, you'll probably notice that a random number seed (seed%=RND(-&DCA)) has been introduced into the procedure. This is for speed-testing purposes.

The actual principle of the QuickSort algorithm is very straightforward and many readers will already be familiar with it. The idea is to take a 'pivot' value – the value of one of the elements of the array of numbers to be sorted.

The numbers are then rearranged so that the first part of the array consists of values less than the pivot and the rest of the values greater than or equal to the pivot.

These two parts are then sorted in the same way and the process continues recursively until the whole array is in order. I must credit the inventor of QuickSort, one C Anthony R Hoare, for coming up with such a neat idea.

£10 SPACE AGE

A simple but effective little program, this one, from Barry Wickett of Walsall. It shows the planetary motions of our very own solar system and you'll find it as listing 4 on the yellow pages. The mouse can be moved around to alter the scale of the diagram. Normally, the paths of the planets are shown in red but holding down a mouse button removes the paths (and speeds up the planetary motions accordingly).

The number of days that have elapsed is shown top left.

As Barry points out, the representation is a much-simplified one. The planets do not travel in circular orbits and are not exactly aligned. In fact, the orbits should be elliptical, and tilted at various angles to the main plane.

However, the lengths of the planets' 'years' are portrayed accurately and hence the demonstration does show how bored the poor old Plutonians must get waiting for Christmas to come around.

Perhaps the feature of Barry's program that I found most pleasing though was the fact that all the arrays are DIMmed to size 10, not 9.

This is an excellent example of forward planning – when the mysterious planet 'X' that has evaded astronomers for so long is finally discovered, we will be prepared!

KEY NOTE

I'm sure many people who move up to the Arc or A3000 from Masters and Beebs find confusion with the numerous "OS_Byte" calls affecting keyboard input values.

Particularly strange are the calls which determine the actions of the function keys, not least because keys f10 to f12 are treatedly separately from the rest. This is, I suppose, an unavoidable throwback to the days of the Beeb and its famous row of just 10 red function keys along the top.

Further problems occur if you wish to make use of the cursor keys. Often, if you're writing an editor of some description, it is necessary to detect SHIFT and CTRL with both function and cursor keys.

The easiest way to manage all these keycodes is to write your own INKEY or GET routine that employs a special case of the relevant "OS_Byte" calls. The calls *FX 225 to *FX 228 define the codes produced by function keys f0-f9 when pressed by themselves, with SHIFT, with CTRL and with SHIFT+CTRL respectively.

Using *FX 225,2, *FX 226,2 and so on, causes these keys to produce a 'null' (Ascii code 0) followed by a unique key code.

If you also use the call *FX 4,2 so the cursor keys and the copy key produce keycodes, these too will be preceded by a zero.

Function keys f10-f12 and the Insert key can be controlled in the same way, but these have their own set of "OS_Byte" calls – *FX 221 to *FX 224.

Having set up the keys using *FX 221,2 to *FX 228,2 you can then make use of the extra zeros that are produced in your own input routine.

If you add &100 to the keycode if a zero is spotted first, you end up with a unique number in the range 0-&1FF. In this way the European ('top-bit-set') characters cannot be confused with function key codes.

Incidentally, the true Ascii code 0 produced by CTRL-@ is also preceded by an extra zero to avoid ambiguity.

All this is summed up in listing 5. The function FNinkey takes note of extra zeros and returns unique values accordingly. PROCinitkeys makes the relevant "OS_Byte" calls to set things up and PROCreset returns things to normal.

If you've programmed in the desktop environment you'll be aware that the keycodes sent to applications are the same as those produced by FNinkey. The only exception is the TAB key which, you've guessed it, has its own "OS_Byte" call.

*FX 219,42 causes the TAB key to produce code 42. More usefully, if the TAB key is programmed with a value of &80 or more (and the function keys have already been set up with *FX 221 to *FX 228) then the TAB key can be made to behave exactly like a function key.

The desktop treats the TAB key like the old function key 10 on the Beeb. You can do this with *FX 219,&8A. Add this command to PROCinitkeys to see the effect.

OS VARS

A quick snippet this. I recently needed to create a menu in a particular application that contained all the 'named' file types (Obey, Sprite, Text, and so forth).

The small program segment needed usefully illustrates how the SYS call "OS_ReadVarVal" can be used and is given as listing 6. The call is made with a wildcarded string (in this case, "File$Type_###"). A buffer (useful%) is provided in which to store any values found.

After the initial call is made, two values are returned – l% (the number of bytes read) and p% (a pointer that is returned to "OS_ReadVarVal" when the next match is sought).

Listing 5 continues to display the values of any matching variables until l%=0, when there are no more.

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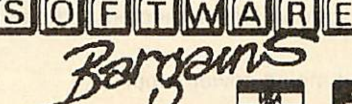
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Epson's budget priced 9 pin printers offer quality and reliability with Epson's advanced paper handling technology, draft and NLQ print in variety of typestyles and fonts:

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LX850 200cps superdraft 30cps NLQ **£209(a)**
FX850 264cps draft 54cps NLQ **£329(a)**
FX1050 as FX850 but wide carriage (132 col) **£409(a)**

Epson LQ range
Epson's 24 pin printers with superior draft and letter quality, variety of typestyles and fonts, high res graphics, advanced paper handling and Epson's reliability:

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LQ550 180cps draft 60cps LQ **£299(a)**
LQ850 264cps draft 88cps LQ **£465(a)**
LQ1050 as LQ850 but wide carriage (132 col) **£589(a)**

Epson Colour Printers
High speed 9 and 24 pin printers with colour option fitted:

EX800 300cps draft 60cps NLQ **£429(a)**
EX1000 as EX800 but wide carriage (132 col) **£549(a)**
LQ860 as LQ850 but with colour **£649(a)**
LQ1060 Wide carriage version of LQ860 **£759(a)**
LQ2550 400cps draft 133cps LQ **£910(a)**

Epson Inkjet/Laser Printers
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SQ2550 as SQ850 but wide carriage (132 col) **£899(a)**
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(Free 12 months on site maintenance included in the price)
DFX5000 9pin Hi Speed Line printer 533cps **£999(a)**

NATIONAL PANASONIC

KXP1081 + Master Printer Lead **£135(a)**
KXP1124 24 pin 190cps draft 63cps LQ **£245(a)**
KXP1540 24 pin 240cps draft 80cps LQ 132 col **£435(a)**

STAR

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LC15 as LC10 but wide carriage (132 col) **£289(a)**
LC10 Colour version of LC10 **£179(a)**
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LC24-15 Wide carriage version of LC24-10 **£349(a)**
NB24-10 **£409(a)**

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DXY1200 **£915(a)**

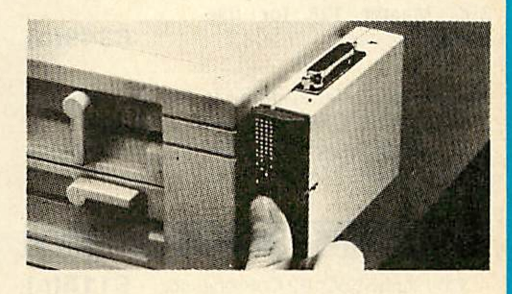
BUFFERS & SHARERS

256K Auto Sharer/Buffers
This smart 256 buffer allows 2, 4 or 8 computers to share one printer. Auto scanning monitors input ports and downloads data into buffer, freeing the computer for other use. Buffer expandable to 1Mb. 25 way D female connectors.

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PBS81/256 8 input 1 output **£289(b)**

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An economical solution for connecting two computers to one Printer or one computer to two printers. Easily attaches to the side of computer or monitor (specify parallel or serial) **£19(c)**



Manual Printer Sharers:

(All lines are switched).	Parallel	Serial
2 computers to one printer	£23(c)	£23(c)
3 computers to one printer	£30(c)	£30(c)
4 computers to one printer	£36(c)	£36(c)
2 computers to 1 or 2 printers	£49(c)	£49(c)

Cable sets for above sharers available for all popular computers

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1 computer to 2 printers fitted with BBC cable **£15(c)**

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Nimbus 2m **£7(d)**
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CONSUMABLES

Serial Interfaces
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Nat Pan KXP17 **£39(d)**
Epson8148(8Kbuffer) **£79(d)**
Taxan **£49(d)**

Buffers
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FX800/850, LQ800/850 **£135(a)**
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Brother HR20 **£209(a)**
KXP1124 **£88(b)** KXP1540 **£179(a)**

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LQ850 **£70(b)** LQ1050 **£85(b)**

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EX800/EX1000 Colour **£15(d)**
Star:
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LC10 Colour **£6.50(d)**
LC24-10 **£5.00(d)**
National Panasonic
KXP1081 **£3.50(d)** KP1124 **£6(d)**
Taxan KP810/815/910/915 **£5.00(d)**
Juki 6100 **£1.80(d)**
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Integrex Colour Cartridge **£16(d)**
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Hitachi 672 6 pen set: water **£18.50(d)**
Oil **£25(d)**
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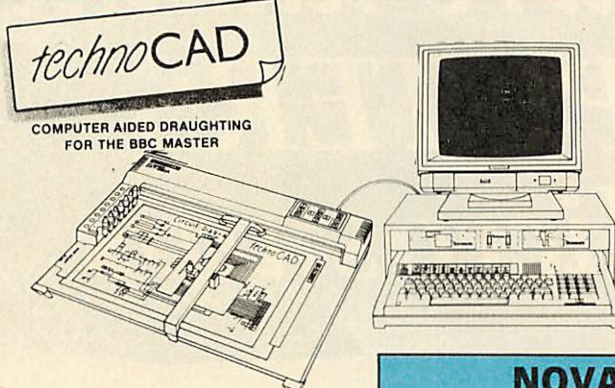
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- ★ User definable grid and scale, together with on screen display of dimensions, and co-ordinates enable easy and accurate drawings.
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- ★ Toolkit program allows customisation of files, utilities and peripherals.
- ★ Drawings can be scaled on screen to suit the plotter or printer in use. A maximum resolution of 0.01mm is available. Preconfigured drivers for many popular plotters and a driver generator for any BBC compatible plotter is included. Printer drivers for Epson 9 pin and 24 pin printers are included as standard as is the facility for installing drivers for other printers. Printers will output in landscape or portrait format.

WHY technoCAD?

The best feature of technoCAD is not its outstanding performance, not its unique ability to allow creation of complex icons, not the quality of output from printers or plotters. The best feature is the unprecedented ease with which it can be mastered. With easy to use single key commands limited to three keys, pull down menus and a clear and concise, easy to read manual, technoCAD is truly the system any one can use.
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Novacad can drive a plotter to produce drawings of highest quality ... Novacad is excellent. It is flexible, genuinely easy to operate without much practice, and a pleasure to use. **Beebug Dec 86**

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Novacad is compatible with all models fitted with Acorn DFS. Hardware requirements can be minimum; single drive and FX80 compatible printer are enough to get started, though its performance is enhanced considerably by use of 6502 2nd processor, dual drive and to a degree with B+ and Master's shadow ram.

The major features offered are:

- ★ Simple and easy to use with logical command sequence.
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- ★ Zoom facility.
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- ★ Text entry at any 90° orientation anywhere on the screen.
- ★ Grid scaling and locking, displacement measurements.
- ★ Printer routine for FX80/100 compatible printers.
- ★ Cursor control from keyboard/tracker ball/ mouse.

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NOVACAD T/M Version	**£39(d)**
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BBC SOFTWARE

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Wordwise plus	**£38(d)**
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InterBase	**£49(d)**

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Viewsheet (Disc Compact)	**£39(d)**
Viewplot	**£24(d)**
InterSheet	**£37(d)**
InterChart	**£25(d)**

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Acorn MicroProlog	**£49(d)**
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MicroText	**£52(c)**
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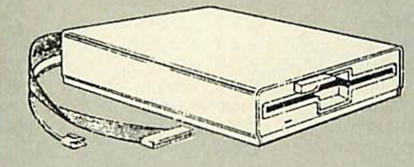
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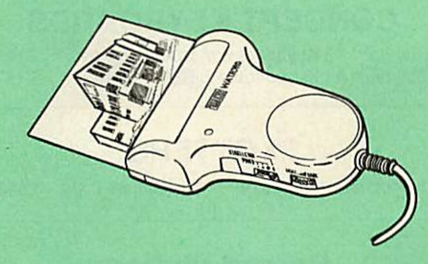
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ECONET Upgrade Kit for BBC B		£42
ALL ECONET UPGRADES Available		
ARIES' IEEE Interface for BBC B & Master		£238
Morley Teletext Adaptor with ATS Rom		£99
Filestore E01S £899	Filestore E40s	£749
Filestore E60S £949	Ecolink	£270

(Carr. £2 to £7 depending on the weight)

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system. The package includes the most comprehensive utility software available for the Archimedes, a high quality, ergonomically designed to fit the shape of your hand, (see drawing above) scanner, which is fitted with a warning LED that will indicate if the scanner is being moved too quickly for accurate results. Additional twin guide rollers ensure precise tracking over the image, to make the best use of the high resolution available with this sytem. The yellow/amber illumination of our Mk II scanner, enables you to achieve optimum accuracy. It is capable of scanning upto an amazing 400 DPI. The scanning area is 4" wide and the height is only limited by the maximu amount of memory available.

On board ROM software supplied, is the most sophisticated Archimedes scanner software yet written.

Price £149 (P&P £4)

Special Discount Scheme

For Teachers, Lecturers & Education. Please phone for further details.

Z88 Portable Micro



Only: **£195** (Carr £4)

FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

32K RAM Pack or 32K EPROM Pack	£18.00
128K RAM Pack or 128K EPROM Pack	£45
512K RAM Pack	£175
Z88 Eprom Eraser Unit	£35
Z88 Spellmaster for Pipedream	£51
Z88 Carrying Case	£9
Z88 Computing Book	£9.95
AA Nicad Rechargeable Battery	£1.50
Battery Charger Compact & Fast	£6
Z88 Serial Printer Cable	£9
Z88 Parallel Printer Cable	£25

● Z88 to BBC Link	£20	● Z BASE	£56
● Z88 to PC Link II	£30	● Z TAPE	£42
● Z88 to Macintosh	£52	● Z TERM	£42
● Z88 Mains Adaptor	£9	● Z88 Modem	£149

By popular demand, we are now supplying refurbished and fully guaranteed BBC Micros with Disc Filing System
(Please telephone for price & availability)

Extended Finance Available

We are able to offer low cost finance to all our customers, including 0% finance on certain items. For further details please refer to page 9, column 3 of our advert.

ULTIMUM – Archimedes A3000 Podule Racking System

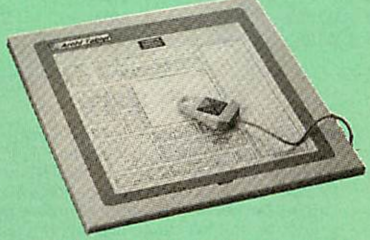
When Acorn originally designed the Archimedes micro, they released to all interested parties the specification of the expansion podule. This has now become the accepted standard for all manufacturers of Archi peripherals. The A300 & A400 both allowed expansion internally up to 2 or 4 podules. However, a newcomer to the affray has caused some upset. A3000 has only a single podule expansion slot, on the outside. There has been deliberation in the industry about a controversial "mini-podule" to be fitted to a special rack. This would entail a re-design of all the available podules onto a smaller board and understandably the manufacturers have rejected the idea completely. As always, Watford have come up with the only real solution to the A3000 expansion problem. The Ultimum Podule Racking System allows up to 3 full size standard A300/A400 series podules to be fitted to the computer. There is also provision for a hard disc drive and podule. Ultimum has its own PSU. There is also an IEC mains output socket for a monitor. It mounts on top at the rear of the computer, and allows direct access to the floppy drive and reset button, rather than obstructing access as on other non standard systems.

Watch this space for launch details.

FREE On-Site Maintenance

This month we are also offering at no extra cost to all our customers, 12 months, On-Site Maintenance on all Archimedes Micros, Philips, Microvitec, and Multiscan COLOUR Monitors. Also on the full range of Panasonic Printers. Should your machine fail, simply telephone the maintenance engineer, who will call in within 12 working hours to repair the unit.
(P.S. This offer is over and above our Unbeatable Winter Sale Offers on Archimedes Micros).
(Offer applicable only when bought at prices advertised in this advert).

Archi Graphic Tablet



This package allows Archimedes users to take advantage of the low cost graphpad (sometimes called a digitiser tablet, but not to be confused with a video digitiser!)

The Archi Graphpad offers performance and accuracy comparable to other graphics tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely.

The software, which is in the form of a relocatable module (RM), intercepts the system calls which control the mouse, and so allows virtually all mouse based Archimedes software to be controlled using the tablet without any modification. The only exceptions are programs which use the serial port, as the tablet is physically connected to this port itself.

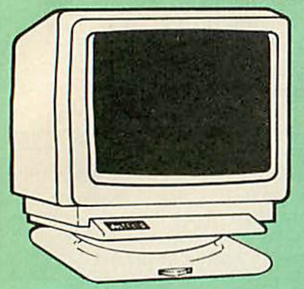
The software is supplied with a special adaptor lead to connect the tablet to the Archimedes' serial port, and a power lead which plugs onto the Archimedes' main board.

(For further details, please telephone or write in for our FREE catalogue.)

Special Price £249 (carr. £4)
(Price includes Tablet, Leads & Software)
Stylus Optional Extra **£29**

Continued→ → → → → → → → → →

MONITORS





MICROVITEC 14"

- 1431 – Standard resolution as used on the BBC television computer programme £175
- 1451 – Medium resolution, suitable for word processing in mode 0 £219
- 1455 – MS Medium resolution, ideal for Archimedes £220
- 1441 – High res, exceeds the capabilities of the BBC Micro £359
- **1431AP** RGB + PAL and AUDIO £199
- **1451AP** RGB + PAL and AUDIO £255
- **2030 CS** 20" Med Res £380
- **2040 CS** 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen** £239

14" MULTISCAN COLOUR

- **TAXAN** 775 Plus – 0.28 Dot pitch Ultra high resolution, anti-static screen £399
- **TAXAN** 770 LR Low Radiation, auto-scanning Ultra High Res £429
- **TAXAN** Multiscan 870 16" Monitor £575
- **TAXAN** Viking 19" Paper White, High Resolution (1152 x 896 with Archi 400 series) £799
- **EIZO** 8060H – For technical info. read the review in Micro User, Jan. '89 £389
- **EIZO** 9060SZ Low Radiation, Super High Resolution, Antistatic screen, multiscan monitor for a wide range of applications. 800 dots x 600 lines. Display for high res VGA. 0.28 Dot pitch £469

TAXAN 12"

- Super Vision 3 – **Type 625** Super Hi-res RGB Colour, Green/Colour Switch £269

PHILIPS

- **BM7502** 12" Hi-res Green Monitor £70
- **BM7522** 12" Hi-res Amber Monitor £71
- **CM8833** 14" Med. Res Colour Monitor £215

STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £189

Dust Cover for Philips Monitors £6
(Securicor carriage on Monitors £7)

SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing at the top), you can easily adjust the monitor viewing angle.

for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

Price £12

SPARE LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

CONCEPT KEYBOARDS

Standard A3 Keyboard with BBC Software	£143
Standard A4 Keyboard with BBC Software	£117

PLOTTERS

- Plotmate A4S **£379**
- Plotmate A3M **£549**

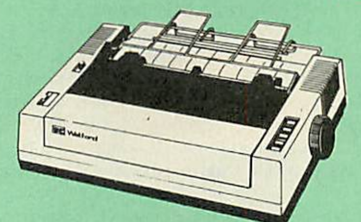
Roland Plotters

(Official Roland Appointed Distributor)

- **DPX 2500** POA
- **DXY 1200** £835
- **DXY 1100** £595
- **DXY 1300** £1015

Panasonic KX-P1081





SALE OFFER only: **£127**

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us)

KX-P1180 Printer Offer

Panasonic KX-P1180 printer, Dump Out 3, Screen Dump ROM & a BBC printer lead.

Offer Price £136

Panasonic Printers

- **KX-P1124** 24pin 80col. 192/63 CPS £219
- **KX-P1540** 24pin 136col. 240/80 CPS £425
- **KX-P1592** 9pin 136col. 216/45 CPS £275
- **KX-P1595** 9pin 136col. 288/61 CPS £345
- **KX-P1624** 24pin 132col. 192/63 CPS £349
- **KX-P1695** 9pin 132col. 330/861 CPS £349
- **KX-P4420** NEW 8PPM Laser –Launch Offer £999

- **Panasonic KX-P4450i** LASER PRINTER Latest technology at Watford's special offer price **£1,325**
- Spare Toner **£29**
- A4 Feeder **£55**
- Drum Unit **£149**
- Developer **£115**
- 1MB RAM Upgrade **£299**
- 2MB RAM Upgrade **£585**

Panasonic Accessories

Cut Sheet Feeders

KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-P1124 (P36)	£85	KX-P1180 (P37)	£79

BUFFERS

P12	4K buffer Board for 1081	£55
P42	32K buffer Chip for 1592/1595	£16
P43	32K Buffer Chip for 1540/1124/1180	£16

Serial Interfaces

P17 P1081/1592 **£32** **P19** P1124/1180 **£55**

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595	£8
P115 for KX-P1180	£8
P145 for KX-P1124	£8
P140 for KX-P1540	£10
Colour Ribbons for KX-P1081, 1592 & 1595 Brown, Blue or Red	£9.95 each

INTEGREX COLOUR JET

- Colour Jet 132 Printer £515
- Paper Roll £6.50
- Screen Dump Software £10
- Colour Cartridge £19.50
- Black Cartridge £11.25
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

Citizen Printer Swift 24 £249

NEC P2 Plus Pinwriter £279

Pinwriter Serial Interface (optional)	£55
P2200 Cut Sheet Feeder	£59
Additional Font Cartridge	£25

NEC PINWRITER P6/P7 Plus

NEC P6+ 80 columns	£439	NEC P7+ 136 columns	£575
Colour Option	£74	Serial Interface	£73
Cut Sheet Feeder	£125		
NEC Ribbons for		P6 £8;	P7 £9.50

Hewlett-Packard Printers

12 months FREE maintenance on site

HP Quiet Jet Plus	£437
HP Desk Jet Plus	£549
HP Paint Jet Colour	£699
HP LaserJet Series IIP	£855
HP LaserJet Series II	£1265
HP Laserjet II TONER	£85
HP Scan Jet	£1499
1Meg Ram Add-on Laser Jet II	£349
1Meg Ram Add-on Laser Jet IIP	£275

Star Printers

LC10 Printer	£136	XB24-10 Colourr	£399
LC10 Colour	£195	XB24 Colour Kit	£35
LC15	£275	LC10 Ribbon Colour	£5
LC24-10 Printer	£215	XB24-15 Colour	£515
LC24-15	£339	Cut Sheet Feeder	£55
NB24-10 Printer	£399		

EPSON PRINTERS

EX800	£429	LQ860 Colour	£510
EX1000	£564	LQ1050	£575
FX850	£315	LQ1060	£649
FX1050	£405	LQ2550+	£925
FX1060	£679	LX400	£132
GQ5000 Laser	£999	LX850	£195
LQ400	£198	SQ850	£490
LQ850	£459	SQ2550	£895
LQ550	£269		

CUT SHEET FEEDERS for

EX800/FX800/850/LQ800/850	£130
FX1000/LQ1000/1050	£175
LQ2550	£390
LX400/800/850/LQ400/500/550	£69

TRACTOR FEED for

LQ800 **£44**; LQ850/FX850 **£69**; LQ1050/FX1050 **£85**; LQ2500 **£90**; LQ2550 **£90.**

ACCESSORIES

- EX800/1000 Colour Option £55
- EX800/1000 Colour Ribbon £14
- LQ2500 Colour Option £65
- Multifont Card for LQ550/850/1050 £95

(Securicor Carriage on Printers £7)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 6'	£6
Nimbus Centronics Lead	£6
IBM Parallel Lead 6'	£6
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper £7
- 2,000 Sheets 9.5" x 11" Fanfold Paper £11
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold £19
- 1,000 Sheets 15" x 11" Fanfold Paper £9
- 1,000 Sheets true A4 Fanfold Paper 70gms £11
- 2,000 Sheets true A4 Fanfold Paper 70gms £19
- Teleprinter Roll (Econo paper) £4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

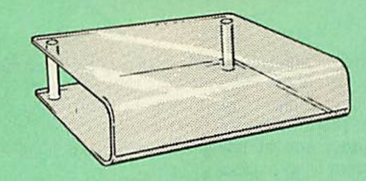
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

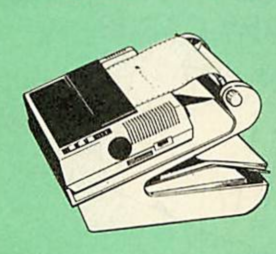
Perspex Printer Stand



Give you Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	**£16** (carr £3)
136 Column version	**£20** (carr £4)

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and refold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £28 (carr. £3)
132 Column version £30 (carr. £4)

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
Brother HR15/20	£3.00	–
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.95	£4.50
RX/FX80/MX80	£3.00	–
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£6.75	£5.00
RX/FX80/85/800/MX80	£3.25	–
RX/FX100/1000	£5.00	–
Kaga/Taxan KP810/815	£4.90	£5.00
LQ500/550/800/850	£4.50	£6.00
LQ1050/LQ2500	£7.00	–
LX80/86/800/850	£3.25	£4.50
M1009/GLP	£3.80	£3.75
NEC P2200	£6.00	£5.00
Panasonic KX1080/81	£3.50	£4.75
Panasonic KX-1124	£8.00	£5.00
SQ2500	£23.00	£5.50
Star LC10/NL10	£4.25	£5.00
Star LC24-10	£5.00	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PCV. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Universal Printer Sharers/Changer

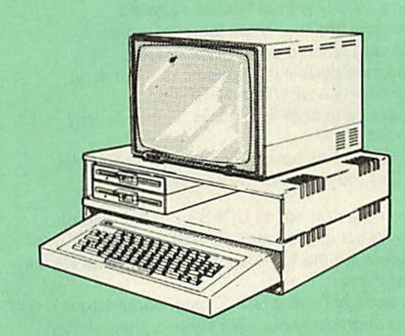
Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments)

Connects	Serial	Centronics	P&P
2 to 1	£20	£22	£3
3 to 1	£27	£30	£3
5 to 1	£36	£39	£4

(Cables extra at £6 each. Please specify type required when ordering)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



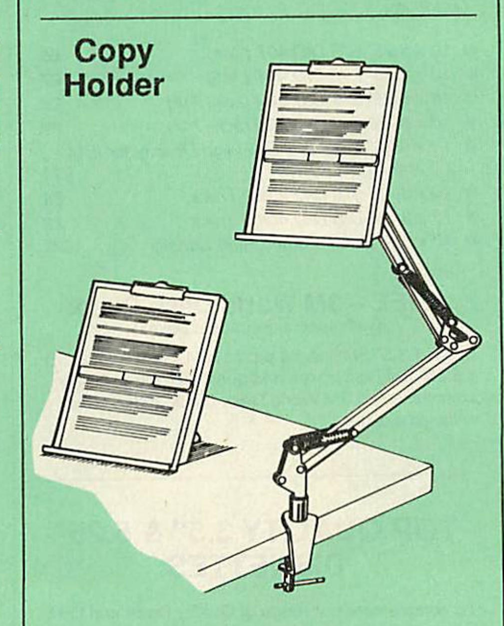
Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	420 x 310 x 105mm	**£13**
Double BBC Plinth	420 x 310 x 210mm	**£24**
Printer Plinth	420 x 310 x 105mm	**£12**
Single Master Plinth	490 x 310 x 105mm	**£14**
Double Master Plinth	490 x 310 x 210mm	**£26**

(Carr. Single plinth £2; double plinth £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding you paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£7** (carr. £3)
Angle poise **£12** (carr. £3)

Handy Printer Switch

A handy two way compact printer switch that enables you to connect 2 Micros to 1 printer, or 2 printers to 1 Micro. Attaches easily to your printer, monitor, etc. A low cost solution for educational establishments. Ideal for those wishing to use a dot matrix and a laser printer. Available in two configurations.

Compact AB Switch Centronics	**£19**
Compact AB Switch RS232	**£18**

(Cables extra at £6 each)

MEGABUFFER 256



The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm.**

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatiblity with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in text unit for both the buffer & your printer.

Only £119 (carr £5)

Payment may be made by credit card, Connect card or cheque, but we also have available a range of finance terms, see the feature in our advert.

THE EPSON RX-FX-KAGA
Printer Commands Revealed

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you are with all sorts of printouts to show its capabilites – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out? Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from Basic and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

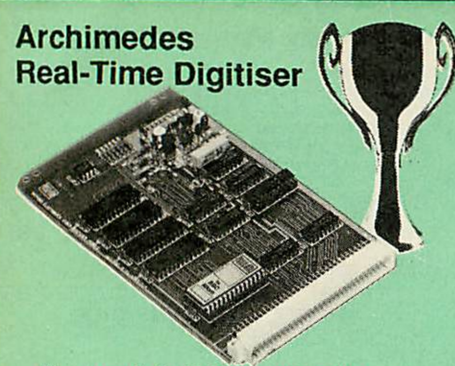
£5.95 (No VAT)



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Continued→ → → → → → → → →

Archimedes Real-Time Digitiser



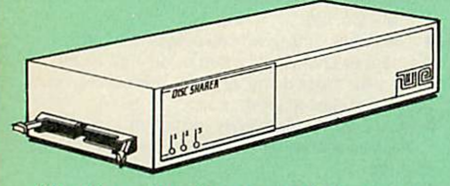
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £249

A Set of Colour Filters for colour image grabbing using a video camera	£16
New Risc-OS Software Upgrade	£39

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price : £65   Price includes 3 Cables

DISC PLONKER RACK



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the harzards of fingerprints, scratches, dust, coffee and an untidy desk.
Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Acorn & Watford DFSs

- Watford sophisticated DFS ROM £16.00
- Watford DFS Kit complete £69.00
- We will exchange your existing ROM for Watford's ultimate DFS ROM at only £12.00
- DFS Manual (comprehensive) £6.95
- Acorn DNFS ROM £17.00
- Acorn ADFS ROM only £25.00
- Acorn 1772 DFS ROM Kit £49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£39.00.**

- SPECIAL PRICE £44.00
- DDFS Manual (No VAT) £6.95
- We will exchange your existing DFS Kit for our sophisticated DDFS for only £30.00

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

- *10 x 5.25" S/S D/D 40T (744)* *£5*
- *10 x 5.25" D/S D/D 40T (745)* *£7*
- *10 x 5.25" S/S D/D 80 Track (746)* *£8*
- *10 x 5.25" D/S D/D 80 Track (747)* *£9*
- *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT* *£14*
- *10 x 3.25" S/S D/D 40/80 Track* *£9*
- *10 x 3.25" D/S D/D 40/80 Track* *£9*
- *10 x 3.5" Double Sided High Density* *£22*

FREE – 3M World Desk Clock

(with special promoted boxes)

Buy 5 x 3.5" 3M special promoted Disc boxes, or 10 x 5.25" 3M Disc boxes and qualify for the specially commissioned 3M World Desk Clock. (Offer valid while stocks last).

TOP QUALITY 3.5" & 5.25" DISKETTES

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

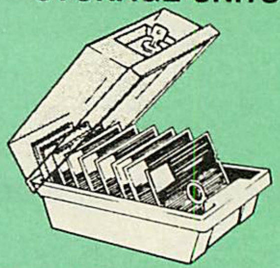
- *10 x **M3** 3.5" D/S D/D 80 Track* *£9*
- *10 x **M9** 3.5" D/S High Density* *£22*
- *10 x **M4** 5.25" S/S D/D 40 Track* *£5*
- *10 x **M5** 5.25" D/S D/D 40 Track* *£7*
- *10 x **M7** 5.25" D/S D/D 80 Track* *£9*
- *10 x **M8** 5.25" D/S H/D Hi-Density* *£13*
- *M2 3" Double Sided* *£3 each*

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

ANTISTATIC LOCKABLE DISC STORAGE UNITS



Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

- **M35** – holds up to 50 5.25" discs £4.95
- **M85** – holds up to 95 5.25" discs £6.95
- **M25*** – holds up to 25 3.5" discs £4.95
- **M50** – holds 50 3.5" discs £6.50
- **M10** – holds 8 of No. 10 Data Cartridges £15

* Not lockable

PLASTIC LIBRARY CASES



Holds up to 10 5.25" Discs.   Only £2.00

DUST COVERS (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

DISC ALBUMS

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special BULK OFFER on 5.25" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)



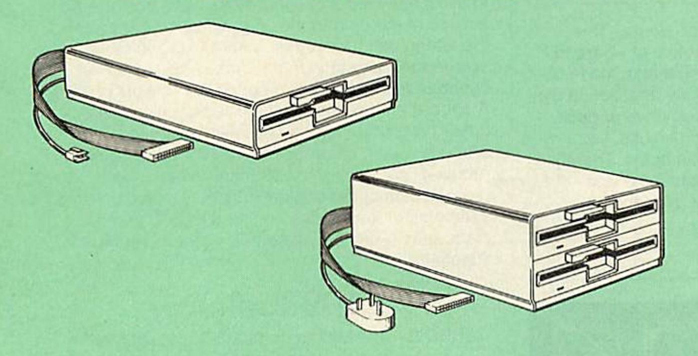
BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
Without Sleeves	£30	£35	£40
With Sleeves	£33	£38	£43

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with an Utilities Disc.
The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high qulity NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public. If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
*Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. **Ideal for Schools & Colleges.** We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £18. (At Watford we anticipate your needs of tomorrow, not just today!)*
When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 4th page of our advert for the Plinths).
P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £75	CLD400 £168	CS 400S £85	CD400 £188
800K (1,44M		CLD 800S £153		CD 800S £163
● TWIN Disc Drive Case, complete with Power Supply & Cables **£43** **Securicor carriage on Disc Drives £6 to £7**				

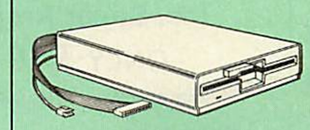
Prefix ***C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

Suffix ***S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5.25" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5.25" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

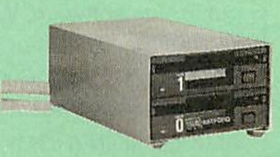
Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£119** (£7 carr) (Offer valid while stocks last)

3.5" DISC DRIVE OFFER



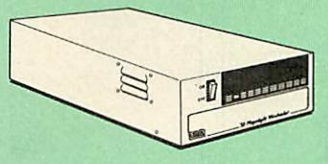
These top quality 3.5" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Drives to connect to BBC Micros own PSU
- **CLS35 400K Unit £65**
- **CLD35 Twin 800K £119**

Drives with built-in Power Supply Unit
- **CS35 Single 400K £85**
- **CD35 Twin 800K £129**

(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

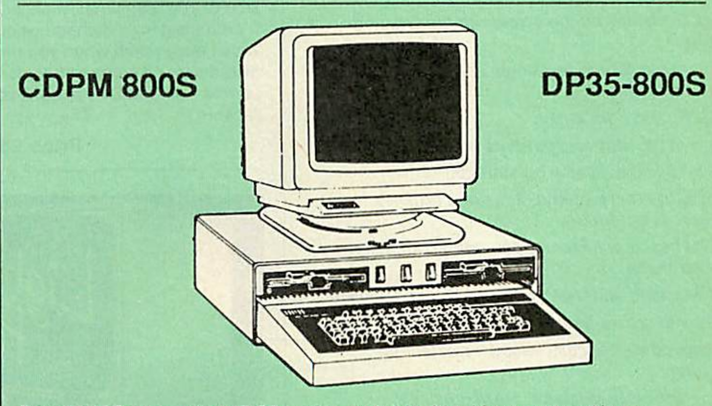
WATFORD's WINCHESTER DRIVES



Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.
Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!
Compatible with the Master, and the BBC B (with 17 X disc interface).

● 30 Megabyte BBC Hard Disc **£395** (carr £7)

CDPM 800S   DP35-800S



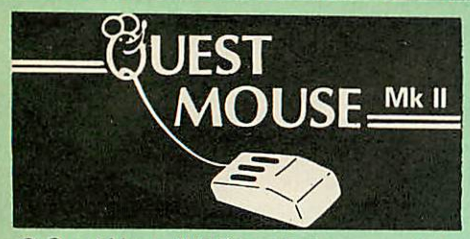
Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

CDPM 800S for the BBC B & Master £175

A Double disc drive with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master series is the 5.25" disk, the standard of the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.
To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S. It contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.
The 5.25" disc drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £165
(Securicor Carr. £7)
(The above drive units are 2 Megabytes unformatted)

Continued→ → → → → → → → →



- Quest Mouse II & Quest Paint £58
- Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse II only £29
- Quest Paint Software only £34
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Part Exchange your unreliable AMX Mouse for a Quest Mouse for only £22

(P.S. Quest Paint is not compatible with BBC Compact)



Winner of the BBC Acorn User 1990 Award for the Best Art/ Graphics software



Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)



ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £39

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£52

THE NEW Mk III AMX MOUSE

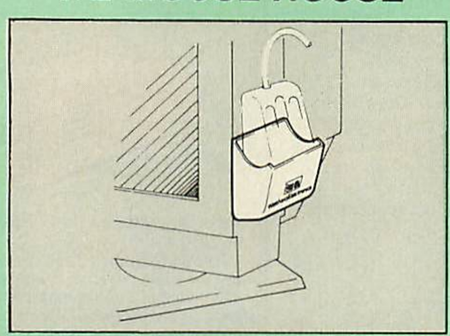
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

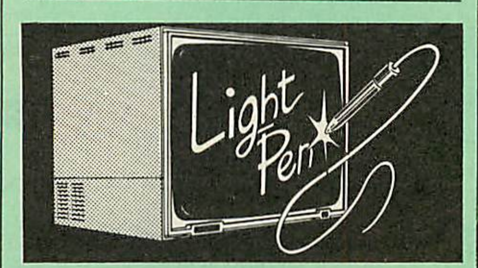
MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE MOUSE HOUSE



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk. It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils – and at £4 it doesn't cost a rodent's ransom.

Price £4



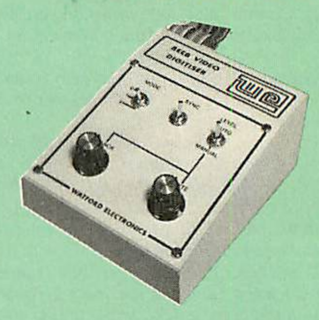
Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional ★ commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it. A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image. Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

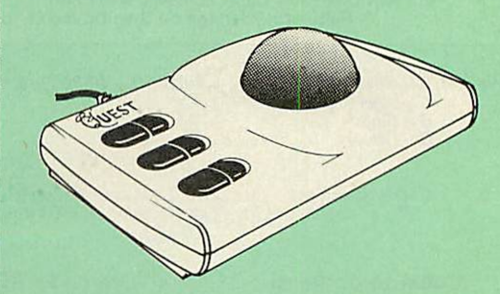
(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

NEW

QUEST – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version	£32
QT-20 Archimedes Version	£35





Winner of the BBC Acorn User 1990 Award for the Best DTP/ Word Processor

The WAPPING EDITOR

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

PAGE LAYOUT SECTION

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module is a mode 0 version of the highly acclaimed Quest Paint package, and incorporates all the same drawing facilities, e.g. pencil, brush, airbrush, polygon, circle, ellipse, fill, cut-and-paste, etc., etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

WORD-PROCESSOR

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

cont./-

THE FONT EDITOR

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.
Upgrading to the Wapping Editor could not be easier since the font editor will convert fonts from other packages, such as Quest Paint or Stop Press (formerly Pagemaker), into Wapping Editor format and a mode conversion utility will convert any screen in modes 1, 2, 4 or 5 into a full grey-scale mode 0 screen. Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser, either independantly or from within the Wapping Editor package.

Wapping Editor Software Pack £69
Wapping Editor plus Mouse £89

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

The Beeb HandScan
Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

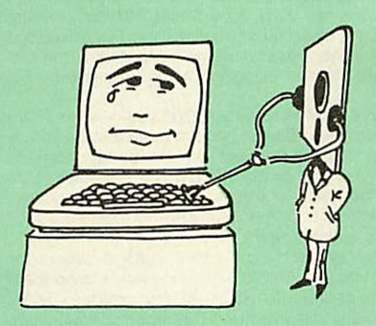
Beeb HandScan & Firmware **£135**

Wapping Font Disc

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions.

£12

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

(Only suitable for BBC B with 8271 DFS)

Payment may be made by credit card, Connect card or cheque, but we also have available a range of finance terms see the feature in our advert.

NEW

Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual.
(Will only work on 360K Disk Drives)

Price: £39

(Please write in for technical literature)

Continued→ → → → → → → → →



ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as th printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£59** (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

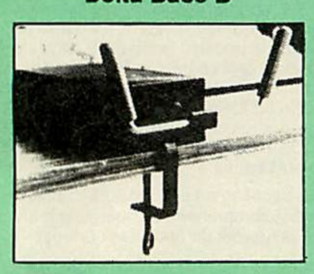
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

VOLTMACE JOYSTICKS

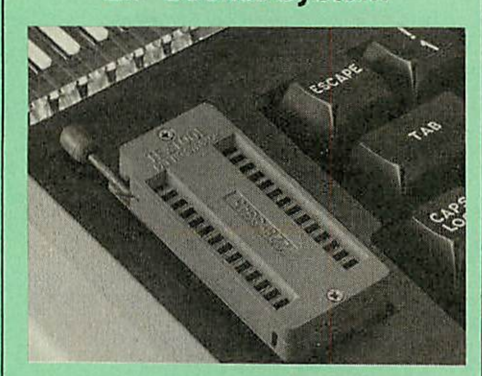
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	£11
● Spare Cartridges	£2.75
● Spare Rack	£1.65

ROM Cartridges for the BBC Master

Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£9**; Quad **£14**

16K Disc Ram Module

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

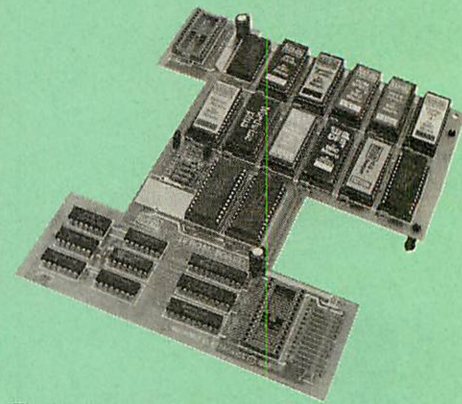
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional Battery back-up fitted £3

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8.50**
(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

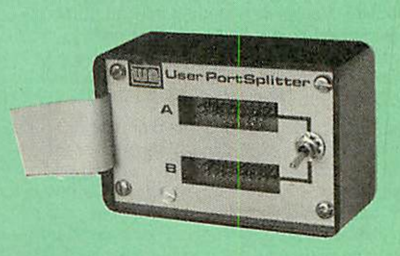
FINANCE AVAILABLE

In these days of expensive borrowing, we are pleased to have negotiated a special low rate finance deal for our customers, with flat interest rate of 12.25% per annum, typical APR 25.5%.

In addition to the above, we are able to offer all Archimedes and BBC Master computers as well as selected hardware on a 0% interest free finance deal.

For further details please telephone: 0923 37774 ext 223/203/201.

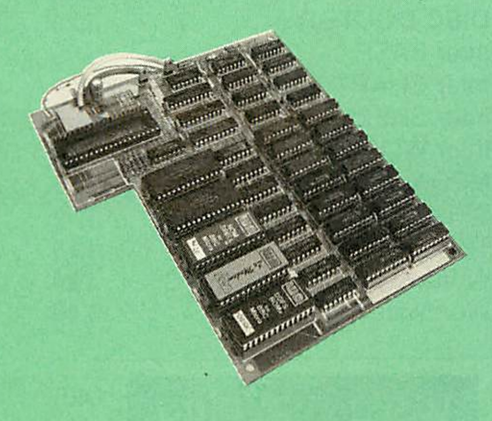
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

NTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM £48
- ROM/RAM card with 64k dynamic RAM £65
- ROM/RAM card with a massive 128k dynamic RAM £109

(carriage on ROM-RAM Card £3)

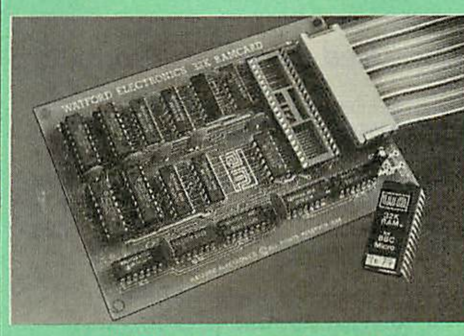
OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £9
- 16k Dynamic RAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches ....£2 each

Complete ROM-RAM board
All options installed £115

P.S.
IS your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K
SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138, 145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)
(Price includes a comprehensive manual and the ROM)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer
Special Offer **£18**

Watford Electronics are:

- Acorn Qualified Dealer & Econet Referral Centre
- ARIES PC Dealer/Distributor
- Cambridge Computer Dealer
- Epson Silver Centre
- EIZO Monitor Dealer
- Microvitec Appointed Dealer
- NEC Appointed Dealer
- Panasonic Premier Dealer
- Roland Plotter Official Dealer
- Star Printer Sub Distributor
- Taxan Monitor Distributor
- 3M Media Premier Distributor

BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £11.25
- Maths with a Story 2 (Disc). 4 further maths programs. £11.25
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. £17.00
- BONDING: Science (Disc) O-Level Chemistry program. £20.00
- ELECTROMAGNETIC SPECTRUM (8 Discs) O-Level program. £20.00
- ELECTRONICS IN ACTION (Disc) O-Level program. £19.95
- NEWTON & THE SPACE SHUTTLE (Disc) O-Level program. £20.00
- ECOLOGY (Disc) O-Level program. £20.00
- POLYMERS (Disc) O-Level program. £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. £20.00
- FOOD & POPULATION (Disc) O-Level program. £20.00
- MICROTECHNOLOGY (Cassette) O-Level program. £11.25
- DEUTSCH DIREKT! (Disc & Audio Cassette) £19.95
- Modem Master (Disc) £11.25
- ADVANCED TELETEXT SYSTEM £8.65
- PERIOD TABLE SOFTWARE £20.00
- Astronomy – Primary (Disc) £12.00
- Computers at Work – Primary £17.35
- Introducing Geography 11-17 years £17.50
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- Black Queen Contract Bridge £13.00
- Espana Viva – 3 Discs £19.95

Educational Software

FUN SCHOOL 2 – Red:
Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic. £13.00

FUN SCHOOL 2 – Green:
6-8 yrs – Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump £13.25

FUN SCHOOL 2 – Blue:
Over 8 yrs – Eight programs on Disc, Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape. £13.50

Versatile **BEEB SPEECH SYNTHESISER** Unit



The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £3)

Continued→ → → → → → → → → →

VIEW 3.0 ROM	**£45**
VIEW PROFESSIONAL	**£50**
VIEWSHEET (Acornsoft)	£36
VIEWSTORE	£36
VIEWSPELL with 80 track disc	£25
VIEWPLOT Disc (Please specify for Master 128 or Compact)	£20
VIEW-INDEX	£12
OVERVIEW packs 1 & 2	£65
HI-VIEW	£38

Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc)	£8
Juki & Brother HR15 (Disc)	£8

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

MINI OFFICE II

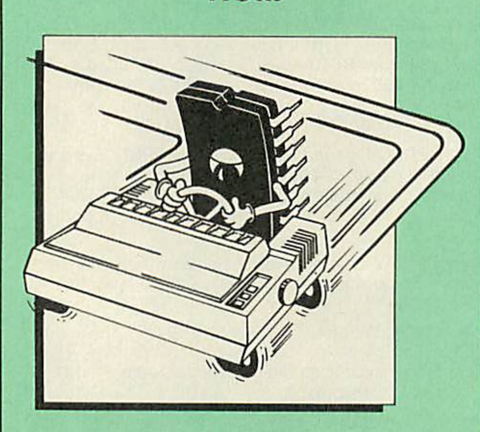
DISC Version for BBC B & B+	**£14.00**
DISC Version for BBC Master	**£16.00**
DISC Version for the Compact	**£18.00**

(When ordering please specify for which Micro & 40 or 80 track Disc)

Advanced Computer Products

Advanced Disc Toolkit	**£28**
Advanced Disc Investigator	**£24**
Advanced 1770 DFS BBC	**£27**
Advanced 1770 DFS Master	**£28**
Advanced File Manager	**£24**
Advanced Control Panel	**£28**

VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing at only a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ★ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

COMPUTER CONCEPT'S ROMS

COMMUNICATOR	**£49**
DISC DOCTOR	**£28**
Inter BASE	**£49**
Inter CHART	**£25**
Inter SHEET	**£37**
Inter WORD	**£36**
MEGA-3 ROM	**£76**
SPELL MASTER	**£42**
TERMI	**£25**
Wordwise	**£24**
Wordwise Plus	**£40**

Wordwise plus **£40**

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

BOOK

The Complete Mouse User Guide to BBC Micro

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

Example programs on Disc £4.95

BOOKS (No VAT on Books)

15 Hr Wordprocessing BBC/View	£5.95
15 Hr Wordprocessing BBC/WW & WW+	£5.95
30 Hour BASIC (BBC Micro)	£12.95
Advanced User Guide for BBC	**£10.95**
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Archimedes 1st Step – Beginners Guide	£9.95
Archimedes Assembly Language	£14.95
Archimedes BBC Basic Guide	£20
Archimedes Operating System	£14.95
Archimedes Risc-Os Programmers Reference Manual	£79.00
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View Guide (View 2.1)	£5.00
Viewsheet & Viewstore Dabhand Guide	£12.95
VIEW Dabhand Guide	£12.95
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Viewstore User Guide	£10
Wordwise + A User Guide	£10.95
Z88 – A Dabhand Guide	£14.95
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Z88 Magic	£14.95
Z88 Using Your	£9.95

Carriage on Books vary between £1 to £3.50, depending on their weight.

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1-2-3 Mastering Release 3	£22.95
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Turbo Pascal Complete Ver. 4.0	£21.45
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THE COMPLETE BBC COMPUTER USER HANDBOOK

"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL – Uses and abuses of computers.

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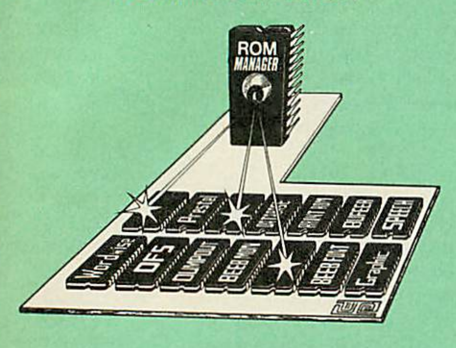
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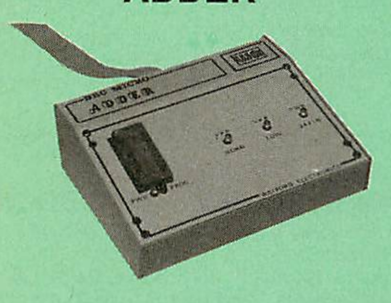
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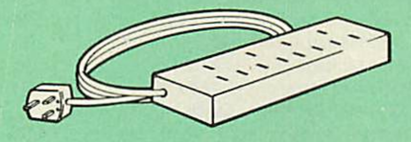
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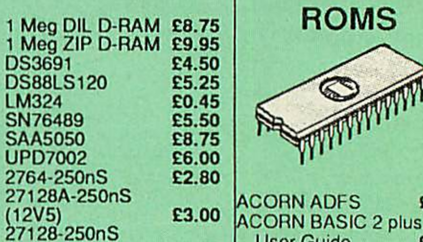
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EIGHT BITS

£15 BBC DEMON

Regular contributor Phil Bender of Romford has written a 'demon' cyclic space program for the BBC micro, to rival the one published for the Archimedes in February's Risc Revue.

Cellular automata have been very much in vogue recently. This particular variety, the invention of David Griffeath of the University of Wisconsin, has a very simple rule, yet still displays complex behaviour.

The rule is that a cell in state k at time t must 'eat' any of its orthogonal neighbours in state k-1 at time t+1. This is shown by those cells taking on colour k. Cells in the maximum state can be eaten by those in state 0, so wrapping round, and giving rise to the description 'cyclic space'.

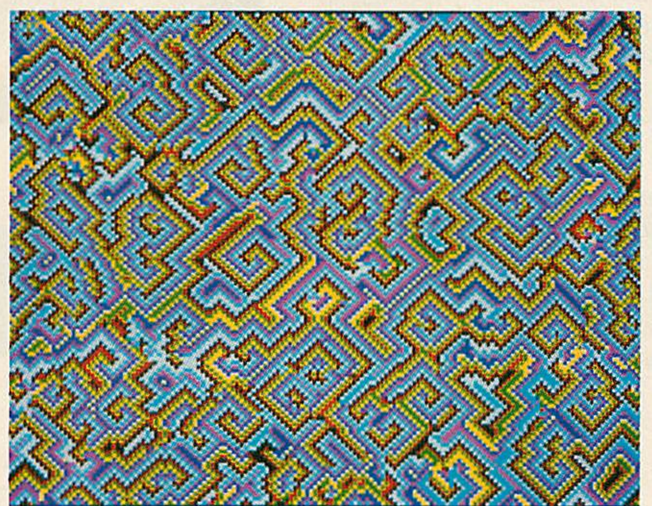
The initial random state is referred to as the 'debris' phase. Within this diamond shape patches of colour develop, eating and being eaten in turn – the 'droplet' phase. Eventually, spiral bands of colour are seen expanding outwards. This is known as the 'defect' phase.

A defect is a closed loop of cells, each of which differs from its neighbours by 0, 1 or -1, the cumulative sum of which is not equal to 0.

This has the property of being self-sustaining, forcing surrounding cells to change state in a regular manner.

Some of these defects are more efficient than others and take over the whole screen. These are the 'demons' of the last phase – hard to distinguish from the defect phase.

For a more detailed explanation see the article, Computer Recreations by A K Dewdney in *Scientific American*, August 1989. The speed at which these phases succeed each other depends on the maximum value. As this increases so the probability of certain configurations arising decreases. Values less than about seven are hardly worth the bother. Values above seven are fine but 15 takes a long time. Still, it could be used as a conversation piece!



Just type in the program in the yellow pages, save and run it. The program starts up in mode 2 and asks you for the startup value (see above). The iterations then begin using fast machine code screen-poking graphics. To pause at any point, press P. Press O to restart. You will have to hold P down until the end of an iteration to make the program pause.

Note that because of the screen writing techniques, the program will not run in a shadow screen mode or with a second processor.

£20 VIEWSHEET GRAPH PLOTTER

Eight Bits regular Andrew Pillidge from Woking has sent an excellent article on *Viewsheet* graph plotting and the linking file feature. The accompanying program is listed in the yellow pages.

Viewsheet is ideal for calculating the value of Grandad's mattress if he knows how much he puts in it each month, and we are going to show you a program that turns the spreadsheet into a graph. Getting numbers out of a *Viewsheet* file directly is difficult but fortunately there is an easier indirect method using something called a linking file.

A linking file, as described in the manual, is a disc file written to or read from whenever your spreadsheet is recalculated, allowing subtotals and the like to be passed from sheet to sheet, for example when your spreadsheet is too big for memory.

However, the linking file is sufficiently simple in format to enable you to use a straightforward Basic program to access the data.

Viewsheet creates all linking files with the name VSn, where n can be any number from 1 to 255. These files are always stored in directory V, which means ADFS users must first create a directory by typing:

```
*CDIR V
```

from the command mode. The file, which is initially blank, is created by:

```
CREATE n x y
```

where n is the number in the V.VSn filename, and x and y are the dimensions of the linking file. As you will now realise, the linking file can store a two dimensional block of values to pass on to another sheet.

Once it's set up, writing a value into the linking file is simply a matter of putting:

```
WRITE(n,x,y,value)
```

into a suitable slot. This accesses the disc file V.VSn and stores 'value' in the location in the linking file with co-ordinates x,y. To read a value from a linking file, use:

```
READ(n,x,y)
```

which reads a value from V.VSn from linking file co-ordinates x,y.

The format of a *Viewsheet* linking file is not actually classified information – it is explained in great detail in the manual, and *BBC Acorn User* has published several programs that read values from linking files, the most recent of which was Bruce Smith's step by step guide to *Interchart* in June 1988.

Each value is given six bytes starting from byte number 6, and the linking file values are stored in order of their x co-ordinate,

row after row. Bytes 0 to 2 of the file contain nothing important. Byte 3 is the maximum y co-ordinate, byte 4 is the maximum x co-ordinate and byte 5 is &AA which is not important. The values are just like floating point variables in BBC Basic.

Armed with this information, you can easily write a Basic program to read values out of a *Viewsheet* linking file and turn them into a graph. In the case of Grandad's pension, you could plot his accumulated wealth over 12 months of the year if you set up 12 slots in the spreadsheet to send the month's accumulated total cash to the linking file.

This file could be 12 slots across and one deep and if you called it V.VS89 it would be created by typing CREATE 89 12 1 from command mode in *Viewsheet*.

If, for example, slots C7 to N7 contain the values you want to plot, then you must set up 12 extra slots in the sheet, for example C10 to N10, to write the values to the disc file. In this example C10 would contain WRITE(89,1,1,C7), D10 would be WRITE(89,2,1,D7) and so on.

Now for three hints. If you put

```
WRITE(89,COL-2,ROW-9,C7)
```

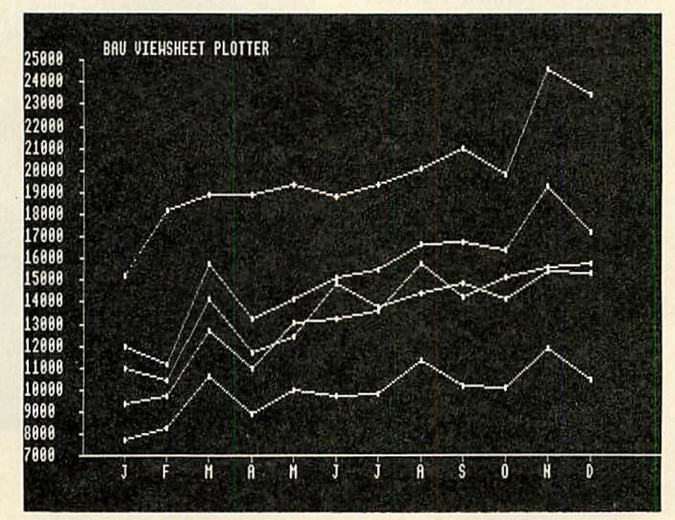
into slot C10 instead of the above, you can replicate it very quickly. The functions of COL and ROW in a *Viewsheet* spreadsheet return the column and row numbers of the slot in which they occur. This allows you to access the linking file in the same relative position as the slot being written.

The second hint is to specify the linking file being accessed in a separate slot. Suppose you put the value 89 into slot E9, and

```
WRITE(E9,COL-2,ROW-9,C7)
```

into slot C10 replicated along to N10, this means you can simply change the linking file accessed by changing one slot rather than editing 12 slots.

The third and final hint is based on the fifth corollary to Murphy's Law, which states



that no matter how you set up a spreadsheet, you will always want to change it just once more after the 'last ever' modification.

In case you decide to insert or delete some rows or columns and thereby shift the location of the slots that contain the WRITE commands, it is tremendously labour-saving to put just above the top left of this block of slots a slot that contains the calculated x co-ordinate of the top left slot of the block, and one that contains the y co-ordinate of the same slot. Why? – because then the whole block can be shifted.

When rows or columns are inserted or deleted above it, the x and y locator slots recalculate their own position and the WRITE commands continue to access the correct place in the linking file.

So, if the top left of the block of slots is slot C10, for example, then put COL-1 into slot C9, and ROW into slot D9, and enter:

```
WRITE(E9,COL-C9,ROW-D9,C7)
```

into slot C10, and replicate it to D10N10, keeping references to E9, C9 and D9 with no change but altering C7 relative.

Back to the Basic program. Assuming you have now set up your spreadsheet, created and filled a linking file, you will now want to get the figures out and plot them. The program in the yellow pages works by opening the file, setting the file pointer PTR to the correctly calculated position and reading values into a variable.

It starts by telling you the file size and maximum and minimum non-zero values. Then it turns it into several line graphs with one line for each row of numbers. The x-axis is labelled J-F-M-A-M-J-J-A-S-O-N-D but if you wished to alter the program to change this it could be done very easily.

The program ignores zero values so that it does not try to plot points for months of the year that have not yet been entered. This also allows the y-axis to start at a non-zero value.

The y-axis is scaled by taking the logarithm of the largest value and chopping off the decimal places to work out the scale interval. The x-axis is scaled to space out as many entries as there are.

So there it is: a spreadsheet to calculate Grandad's accumulated pension, compound interest included, and a block of slots to write values along a row into a linking file and a program to read them out and plot a wonderful graph.

The program is written to cope with many different sizes of linking file and it has proved very useful.

The procedures for getting the dimensions of the linking file and for getting values from it could be incorporated into your own programs, for example, to write a program to turn spreadsheets into pie charts or histograms or some more complicated statistical evaluation.

Calculating a correlation coefficient or chi-squared value would be easier in Basic and a *Viewsheet* linking file is one possible way of getting at the raw data.

£10 MASTER 512 DISC PARTITION

It is a while since I have had a contribution from our Dutch followers – by far the most enthusiastic group of BBC users anywhere in Europe (including Britain!) so it is good to publish this contribution from Henk Oostrom from Zoetermeer as a follow up to Andrew Rawnsley's article in the January 1990 Eight Bits. Henk has asked for his contribution fee to be donated to charity, which we are pleased to do.

Henk finds the procedure described by Andrew Rawnsley to be a little cumbersome and presents an alternative solution in a program which does all the work. This program (in the yellow pages) makes a complete Dos partition of any size.

After creating the partition, you can start Dos Plus from the system disc and run the *HDisk* utility to install Dos Plus on the hard disc, using the 'Make hard disc bootable' option.



To prevent the disc head having to skip over the large DRIVE_C file when working without the co-processor, the partition is placed at the end of the free space.

When working under Dos Plus, the ADFS free space map and the directories are not used, all the filing operations take place within DRIVE_C. So, in

both instances, the hard disc is running optimally.

There is of course a snag to this solution. When you compact the disc, the DRIVE_C file is moved. This can be prevented by deleting the DRIVE_C file, performing the *COMPACT and then running the restore program, also provided in the yellow pages, and on the monthly disc. You will end up with a compacted hard disc and the DRIVE_C file restored.

The partition creation program works by asking for the number of megabytes required on the partition and then calculating the length of the DRIVE_C file. A dummy file is made to fill all extra space on the disc, and DRIVE_C is then created using OSFILE.

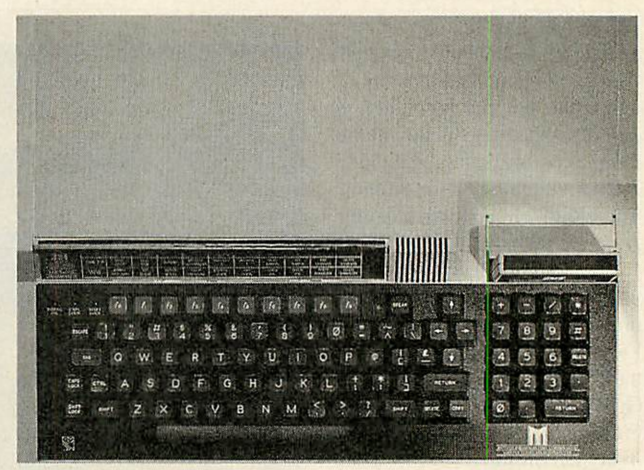
The dummy file is deleted and DRIVE_C is filled with information for the header, the file allocation table (FAT) and the root directory.

The restore program just creates the same files again, using the size of the Dos Plus partition written on the hard disc by the creation program. Incidentally, this file $.DOS.LEN_DRV_C must not be deleted or the restore program will not work.

The restore program reads the LEN_DRV_C file and alters the ADFS directory and free space map. Since the file is in the same place as before, and no actual data has been written to the file, all the data is available as before.

To summarise, the creation program creates the partition to your specification and should immediately be followed by running *HDisk*. The restore program is only needed if you want to compact the ADFS portion of the hard disc and you want to keep the DRIVE_C partition at the back end of the disc. If you aren't bothered, then just ignore the second program. To run it, *DELETE $.DOS.DRIVE_C then *COMPACT.

Check this with *MAP and if there is more than one gap, *COMPACT again. Now run the restore program.



Do not do anything else with the hard disc in between these steps, otherwise you will lose the partition data.

POINTS ARISING

John Buckley of Cheadle has written to say 'I would prefer it if contributors to your magazine would avoid writing phrases such as: of course it is perfectly straightforward to assemble the program to run at a different location in memory. I haven't a clue how to achieve this'.

Sorry, John, we do sometimes let these assumptions slip through.

A lot of the programs in Eight Bits are short assembler utilities, which often occupy less than 256 bytes on memory when converted to pure machine code. The programs are always presented as source code (assembler) and near the start of the program will be a line setting the value of P%, for example:

```
P%=&9ØØ
```

Sometimes it is set to another variable's value but this will be assigned earlier in the program. The way to assemble the machine code to run elsewhere in memory is to change the value of P%, by altering that line of the source code and then running the program.

At the end of the routines we publish, there is always a line to save the assembled code to disc (maybe a straight *SAVE command or perhaps an OSCLI command containing the SAVE command). If the parameters are actual numbers like

```
*SAVE CODE 9ØØ AØØ
```

then these too must be changed. If they are variables such as:

```
OSCLI ("SAVE CODE"+STR$~M%
+"+"+STR$~(end%-M%))
```

then no alteration is necessary as the alteration of the variables at the start of the program will adjust the save instruction automatically.

You must alter the source code and create (save) a new machine code program.

It is pointless trying to alter the machine code file once it has been assembled.

Of course altering the program address is one thing, knowing what to alter it to is something else.

On a disc-based BBC micro, a routine which is less than 256 bytes long can equally well run at &900 or &A00, or &B00 if you don't use the function keys or &C00 if you don't use definable characters. (Master owners can use these last two locations in any event).

A machine program may also run at any address higher than the value of PAGE (but lower than HIMEM).

There isn't room here to describe all the possible memory areas which a program can use but all the technical manuals for the BBC and Master cover this in great detail.

If anyone else is confused by anything written in this column, do write and let me know, and I will try and explain it.

Send queries to the same address as for submissions, which is: David Atherton, Eight Bits, *BBC Acorn User*, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.

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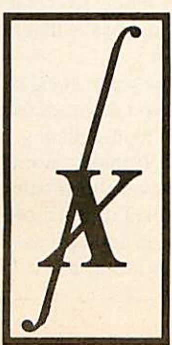
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IN THE MODE

Designer display expert **DAVID ACTON** swings in to tell you how you can get the Arc's screen into shape

Do you remember the time when the BBC micro had just eight screen modes? Around the time footballers wore long trousers and butter cost threepence a ton. But in these days of Arcs there are so many modes it's difficult to find cupboard space for them.

Where, we might ask, did they all come from? What, we could continue, are they all for? And how, we may tiresomely persist, can we create our own new screen modes? Simple.

The first step in the mode maze is to realise what modes are all about. Broadly speaking, there are two sorts – graphics (the largest category) and non-graphics (the teletext mode and the so-called 'gap' modes 3 and 6).

Graphics modes can be subdivided according to the number of colours available – 2, 4, 16 or 256, or by their resolution vertically or horizontally.

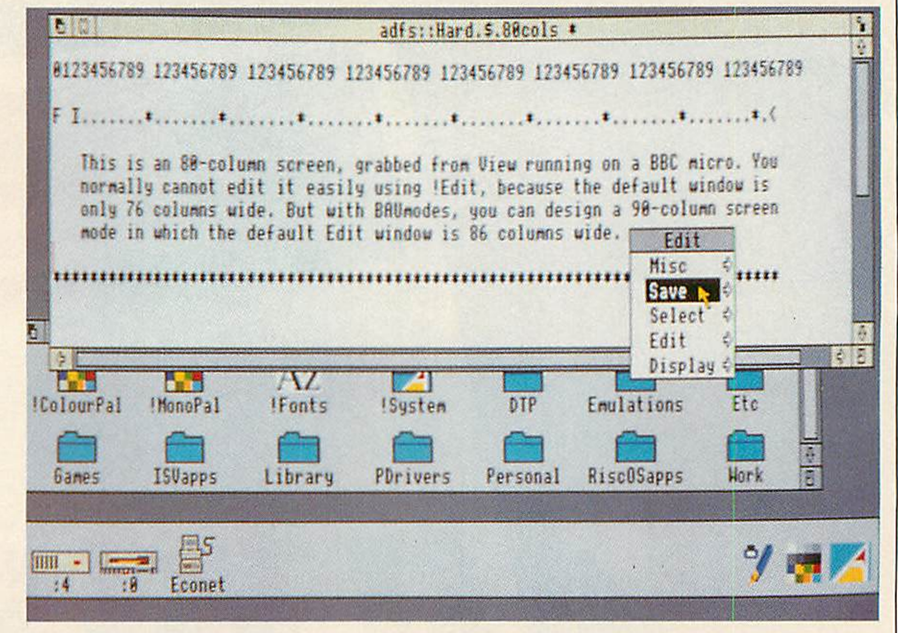
Details of the basic screen modes can be found in your User Guide or Programmer's Reference Manual.

Prior to Risc OS most programs that did anything at all interesting or pretty were mode-dependent and fell over in a heap if run in a different mode. The Risc OS philosophy dictates that programs that live and breathe in the desktop environment should be 'mode-independent'. However dreadful your beautiful 256-colour mode 15 program may look in mode 0, it should at least be usable.

That is the rule. And, to this end, Risc OS makes it surprisingly easy to write mode-independent programs.

The feature of Risc OS which really brings this mode-independence lark into its own though, is how easy it makes the business of designing your own 'custom' screen modes. Having done so, you can be sure that the desktop and all 'well-behaved' applications will function perfectly in your new mode.

Before coming to the actual technique of designing modes, it's worth first pondering over what makes a mode in the first place.



Each mode is defined in two parts. The first consists of a set of values for 'mode variables'. These are numbers used by Risc OS (and which can be read by the user) which define the mode in terms of number of colours, resolution, size of screen in bytes and so on.

Secondly, each mode is also defined in terms of parameters sent to the video controller chip, VIDC (Very Ingenious Display Contraption). More on these later.

Listings 1 and 2 on the yellow pages illustrate a couple of system calls which can be used to read mode variables and which you may well want to use when experimenting with different modes. Run listing 1 and enter a (valid) screen mode. A command of the form:

```
SYS "OS_ReadModeVariable",m,n TO ,,v
```

reads the value of mode variable n in mode m and returns it in v. You'll find a list of mode variables in the Programmers Reference Manual, but listing 1 reads two of them – 0 (mode type) and 3 (maximum logical colour).

You'll also note the use of SYS OS_CheckModeValid to see if the mode you've chosen is valid or not. If not, it returns a mode number (realmode% in listing 1) which is the mode that will actually be chosen if you try to select the invalid one.

Modes can be invalid if they are not defined, require a special sort of monitor or need more screen memory than is currently available.

Whereas OS_ReadModeVariable can be used to find details of a mode other than the current one, the call OS_ReadVduVariables is called to find out information about the current mode. A list of mode variables is provided in a table (terminated with -1) and a list of corresponding values is returned. Listing 2 illustrates this, showing the default graphics window in mode 15. (Note that the co-ordinates are 'internal' – that is, as Risc OS might use them.)

To see the differences between standard Risc OS modes (and any you might define yourself) you might like to use listing 3 which is a mode testcard. It makes use of OS_ReadVduVariables to discover information about the selected mode, then draws a pattern and displays information appropriately. The program begins by printing a list of

valid modes. Again, OS_CheckModeValid is used and, to speed things up, the variable swicmv% is used instead of the full title of the call. Even so, it takes a little while to check out which modes are okay because it has to ask around for each possible value.

Only numbers between 0 and 255 are checked for validity. (In fact, only modes up to 127 are really valid although, perhaps as an aftermath of shadow screen memory on Masters, 128 to 255 are 'shadow' versions of 0 to 127).

Variables are set according to the particular mode selected and their meanings are summarised in table 1.

Using these variables, information about

modeflags%	graphics/non-graphics flag
columns%	number of text columns
rows%	number of text rows
colours%	actual number of colours available
xpix%, ypix%	horiz, vert number of pixels
xeig%,yeig%	factors by which xpix% and ypix% must be adjusted to provide value for MOVE, PLOT, DRAW, etc
xcharsize%, ycharsize%	characters size plotted with VDU 5

Table 1 – Testcard variables

the mode is displayed in boxes over the background pattern in as 'mode-independent' way as possible outside the desktop.

And so to the design of new modes. Mode definitions are stored in relocatable modules. Those of you who have not programmed in Arm code, or have not read about modules in Risc Revue please stay tuned! There is little to grapple with and the Arm code required is minimal.

Enter and run listing 4. It will ask you a series of questions. Feed it with details about the mode you want to design and then give your new mode a number (123 is suggested). The module containing your mode is then saved (with a name of your choice) and installed. Finally your new mode is selected, so try it out!

The module itself contains very little. It begins with a standard header which, in this case, consists largely of EQUD 0. The only piece of Arm code in the module begins at .service.

This listens for a service call which is made by Risc OS when an unknown mode has been selected.

If this service call (number &50) is made and the mode chosen is ours then we 'claim' the call (with MOV R1,#0) and tell the operating system where it can find two tables.

The first is a set of values that need to be programmed into VIDC, the second a set of mode variables of the sort we have seen earlier. To reduce the amount of work needed, each new mode is based on an existing one, so that any details you don't supply are assumed to be the same as the base mode.

For example, if you were defining a wide two-colour mode you might base it on mode 0 and only specify those parameters concerning the width. You should always choose a base mode with the same number of colours required for the new mode – this saves programming the palette registers of VIDC. Listing 4 sorts this out automatically, choosing a base mode 0, 8, 12 or 15 as appropriate.

Run listing 4, design a new mode and try it out in the desktop.

The usefulness of particular varieties of mode does depend on the sort of monitor you have.

I've found that a 92 by 33 character 16-colour mode is very usable on my standard Arc monitor though.

The table of mode variables begins at .wslist. The first word should be zero (allowing for future expansion).

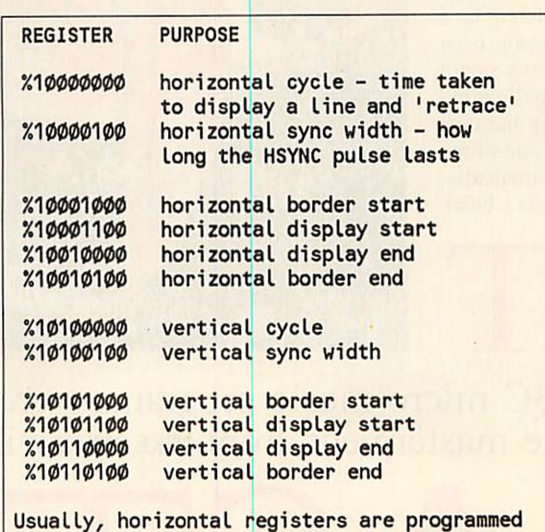
Next comes the base mode and then a list of pairs of values terminated with -1. Each pair consists of a mode variable and its value for our new mode (as will be read by OS_ReadModeVariable).

All should be self-explanatory but refer to listings 1 and 2 if it helps.

The VIDC list looks a little odd because of the odd way VIDC is programmed. VIDC has several registers (summarised in table 2) but rather than putting the desired data into a memory location to program such a register, the data is included in the address of the register.

The practical upshot of this is the list (at .vidclist) consists of a set of register numbers shifted left by 24 plus the appropriate data shifted left by 14.

If you really want to know why, have a look at the VIDC manual but for the purposes of designing new modes it is enough to know what the main registers are for. Just follow the example of listing 4.



REGISTER	PURPOSE
%10000000	horizontal cycle - time taken to display a line and 'retrace'
%10000100	horizontal sync width - how long the HSYNC pulse lasts
%10001000	horizontal border start
%10001100	horizontal display start
%10010000	horizontal display end
%10010100	horizontal border end
%10100000	vertical cycle
%10100100	vertical sync width
%10101000	vertical border start
%10101100	vertical display start
%10110000	vertical display end
%10110100	vertical border end

Usually, horizontal registers are programmed in 2-pixel units, vertical ones in 1-pixel units. Adjustments should be made depending on number of colours used. Other VIDC registers control cursor, interlace and sound.

Table 2 – VIDC registers

It is easy to design different modes

Essentially, the number of pixels across the screen in your mode is subtracted from the total number VIDC can display.

The remainder is 'shared' out so that the border occupies about half of the space off each side of the screen and the displayed area is central.

The same principle is applied vertically. The only VIDC parameters that are fixed (and not calculated from the data you enter) are hcycle%, vcycle%, hwidth% and vwidth%. These have the values they do because of the base modes used (0, 8, 12 and 15). Changing them may result in the breakdown of the picture. Look at table 2 for more details.

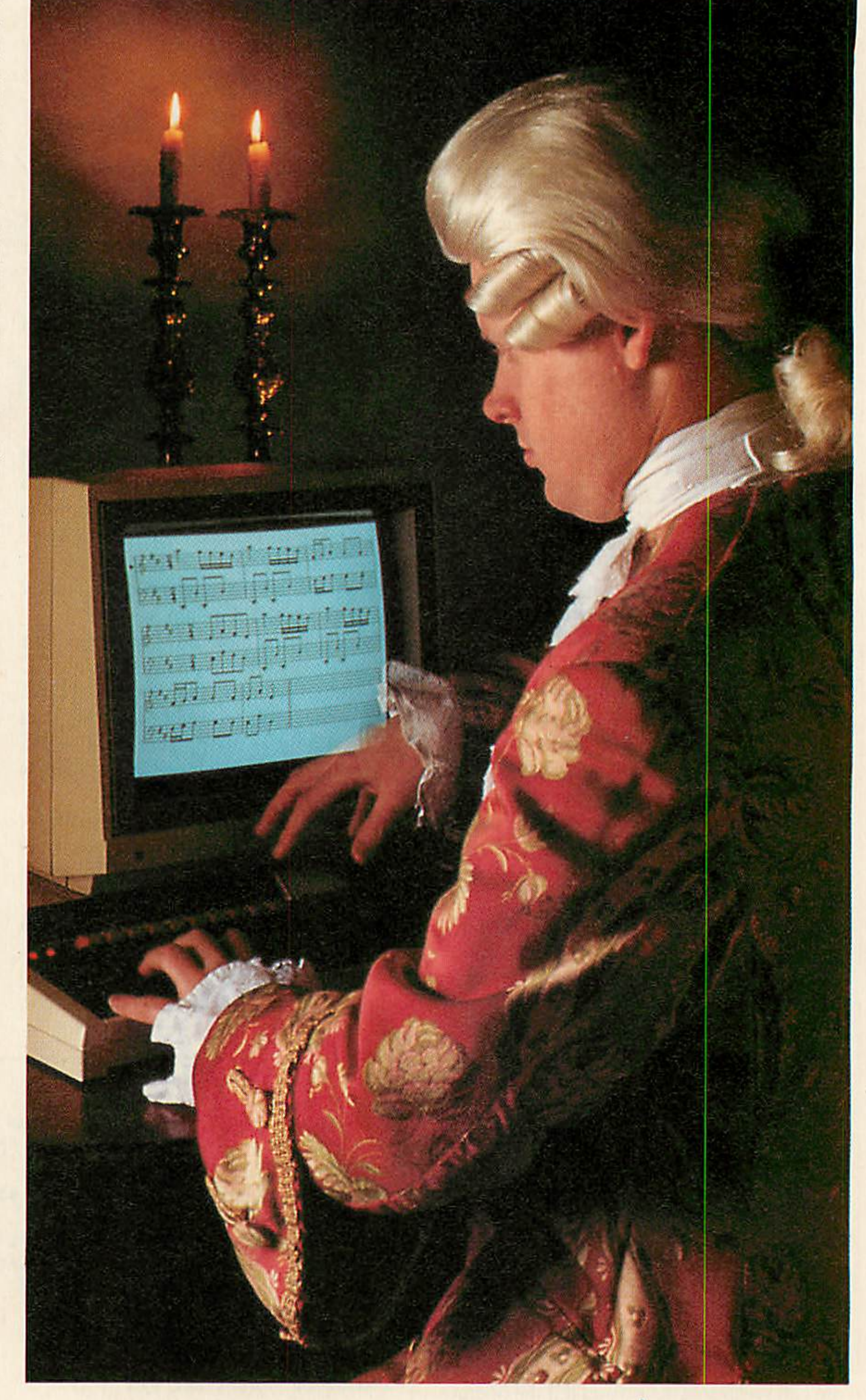
Useful new modes might include an 84-column 16 colour mode for editing text – window borders mean you can't edit 80-column text in mode 12 on the desktop. Video applications might also require a particularly wide and deep mode so that the 'safe area' is completely covered. (And if you have any further thoughts or suggestions, send them in to Risc Revue).

Finally, should you wish to use a 'new' mode commercially you should ask Acorn for an 'official' mode number in writing.

But hurry – there aren't many left!

BEAT MASTER

If you thought BBC micro music programs were all washed up then think again; this ultimate masterpiece from MIKE SMITH will get your fingers tapping



Photograph by John Barlow

If you need a chord accompaniment for a brilliant solo or you are into drum machines, bass sequencers and keyboard synthesisers, here is a program that stretches the BBC micro's sound capabilities and Basic to the limit to provide everything in one package.

Chord and drum sequences can be composed or entered from sheet music using standard musical terminology. Rhythms and bass and drum patterns can be input and varied from the keyboard as the music is playing. Instruments can be synthesised and changed without missing a beat!

You can generate 'computer composed' music or use the 'backing tracks' for a solo played on the BBC micro's keyboard, with facilities for recording, auto-repeat of 'loops', and 'punch-in' editing on replay.

The program runs in mode 7. It will run on a BBC model B, B+, Compact or Master providing PAGE is at or below &1300.

Main menu

Strum starts with the main menu, accessing all functions by single key presses. Pressing ESCAPE at any time returns you to the main menu with parameters unchanged but sequences will begin again from the start. Below the main menu is a table of presets that are accessed with the function keys.

The presets can be changed by loading sets of parameters previously saved on disc or by pressing the default keys.

You can quit the program from the main menu, saving any presets or sequences first, by pressing Q. The computer is left in Basic, mode 7, with normal cursor, auto-repeat, and editing functions. Selecting C allows you to enter or edit a chord sequence.

Up to 50 chords can be entered in a sequence. If a sequence has already been entered, it will be displayed. Any chord can be edited by moving the highlight using the cursor keys and entering the new chord. New chords added at the end of the sequence advance the cursor automatically. TAB deletes the chord, COPY inserts a blank

space and each new entry must be followed by RETURN. The note 'root' (A-G) should be entered first. Upper-case accents the whole chord. A sharp (#) or a flat (v) adjusts the root note accordingly.

Chord notes are determined by the suffix added. Major chords need no suffix, except major sevenths which require 'M7' to distinguish them from dominant sevenths. All minor chords need 'm'. Augmented, Diminished, and Suspended fourths are entered with the usual musical terms. Sixths, Sevenths, Ninths, Elevenths, and Thirteenths can be added. Chords can be repeated with / and rests introduced with '. A series of chords can be repeated by enclosing them within brackets '()', with nested loops up to 10 deep. The whole sequence will repeat when played.

User-defined chords, scales or harmonies can be set up on the preset function keys, as explained later, and entered with k or K followed by the function key number.

Drums and wires

Up to 50 drum patterns can be entered, using the presets defined on the function keys. There is no need to press RETURN. If a sequence has been previously entered, it will be displayed and can be edited by moving the highlight with the cursor keys and entering a new pattren.

Patterns added at the end of the sequence advance the cursor automatically. TAB deletes a pattern, COPY inserts a copy of the pattern highlighted. Again, a series of drum patterns can be repeated by enclosing them within brackets with nested loops up to 10 deep.

Playing around

Pressing P from the main menu starts the sequences playing but it is not essential to enter either a chord or a drum sequence to play. Pressing a function key repeats the drum pattern and any function key with SHIFT repeats the chord. f0 or SHIFT-f0 stops them.

If a chord or drum sequence has been entered, it will start playing from the start of the sequence, automatically repeating at the end. The sequences are independent but the timing of notes and hits is synchronised.

If a function key or function key with SHIFT is now pressed, the preset drum pattern or chord will override the sequence until f0 or SHIFT-f0 is pressed to return to the sequence. This allows 'in-fills' or occasional variations in harmony. The sequence of chords is displayed, and the current drum pattern is highlighted. There are numerous parameters shown on the Play menu, which can all be varied, or toggled on or off with single key presses. Values of variable parameters are indicated, on states are highlighted in red and off in yellow.

The tempo is the time taken in 1/100s to play all the notes in a bar. It can be increased or decreased by the number of beats in a bar using the cursor keys, or by 10 times with SHIFT.

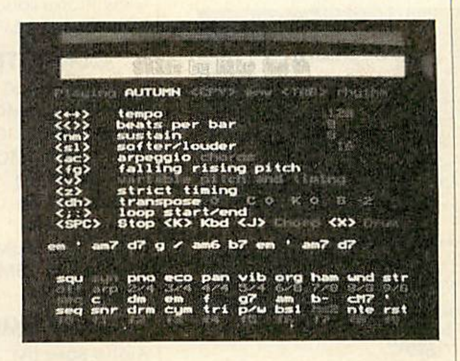
The beats per bar value (altered with < and >) is strictly per chord. If a rhythm or drum pattern is playing with more notes, the remaining notes will not play, and if less, there will be a rest for the remaining beats.

Sustain (n and m) refers to the length of each individual note (as distinct from tempo or beat settings) in 1/20 secs. It allows notes to be played staccato, legatto, or overlapping to create sustained chord arpeggios like vibes or organ. It can have a great effect on the sound of an instrument as set by the envelope parameters and is worth experimenting with.

The softer/louder value (s and l) is the relative difference in amplitude and relates to the attack and decay levels in the envelope parameters for unaccented notes. Accented chord, drum, bass or keyboard notes are not affected. The overall volume cannot be changed with software.

Unless a rhythm preset has been selected, the arpeggio chords switch (a and c) determines the way the chord is played. Chords play three notes simultaneously if the keyboard is off, and two notes otherwise. The chord inversion is determined by the note selected for each beat. The falling/rising switch (f and g) is for arpeggios, but also affects any bass line and the chord inversion if 'chords' are selected.

Variable pitch and timing (v) selects notes at random, although biased to the centre of the chord. Timing is de-synchronised to allow notes to play singly or in chords at random. This can be modified by pressing



A or C. If strict timing (z) is switched on, a note is played on every beat. If off, the program chooses a length of note at random, up to four times the length of a single beat.

All notes can be transposed (d and h) by a semitone for each keypress, in unison over an octave range. The number of semitones from the original setting is shown. However, if SHIFT is pressed as well, the keyboard, chords, or bass are raised or lowered by a whole octave.

This operates on a priority basis. If the keyboard is on, only the keyboard will be changed. If the keyboard is off and chords on, only the chords are transposed. But if both keyboard and chords are off, the bass will be changed. The current octave is shown for each in relation to the initial chord setting.

Stop (SPACE) of course stops or restarts the music. It is a useful function as the various settings can still be changed by single keypresses. Also, the keyboard can be played but with no 'quantisation'.

The keyboard switch (K) toggles the keyboard on or off. The keyboard has a range of two octaves, from C at TAB to C at the up cursor key. 'Black' notes are on the row above, from 1 to \. If Stop is off, the key-

```
STRUM by Mike Smith (c)1989

MENU  Enter selection..

<Q>   Quit program
<C>   enter or edit Chord sequence
<D>   enter or edit Drum sequence
<P>   Play chords, drums, or keyboard
<K>   record Keyboard sequence
<E>   replay or Edit keyboard sequence
<L>   Load
<S>   Save
<I>   default Instruments
<M>   default drum patterns
<R>   default chord Rhythms
<F>   edit Fkey chords

<ESCAPE> to return to Menu

squ syn pno eco pan vib org ham wnd str
off arp 2/4 3/4 4/4 5/4 6/8 7/8 8/8 9/8
seq c   dm  em  f   g7  am  b-  cM7 '
seq snr drm cym tri p/w bs1 bs2 nte rst
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board will start and stop notes 'on the beat'.

The chords switch (C) toggles chords on or off. The sound stops but the chords are still displayed, giving a visual indication of the sequence. Bass or chord notes in the drum patterns play according to the chord displayed.

Finally, the drums switch (X) toggles drum patterns on or off. The sounds stop but the current pattern is still highlighted on the function key table.

Function keys

The function keys used with SHIFT and CTRL select the instrument presets. If the keyboard is on, the keyboard instrument will change, otherwise the chords instrument. So, it is possible to have two different instruments (as well as the drum and bass sounds) playing at the same time.

The rhythm presets are selected with function keys and CTRL. These are preset sequences of notes played in a chord, instead of automatic selection. The beats per bar are automatically adjusted to suit the rhythm. The preset chords are selected with function keys plus SHIFT and the function keys alone select the preset drum patterns.

All enveloping

While in Play mode, pressing COPY will enter the dynamic envelope menu. This allows you to alter the parameters of the current instrument with single keypresses while playing chords. It is a very powerful feature allowing the effect to be heard immediately.

The current parameters are displayed. Use the up and down cursor keys to select the parameter and alter the value with the left and right keys, one unit at a time, or 10 units by pressing SHIFT as well.

The altered parameters will be shown, with the current one highlighted. The initial settings remain displayed for comparison.

You can select another instrument at this stage, using the function keys with SHIFT and CTRL.

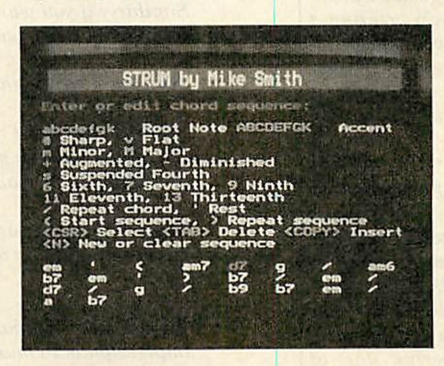
First you have the option of changing the three letter name, pressing RETURN to continue. In this way, a whole bank of different presets can be created (and saved to disc from the main menu). Pressing COPY returns to the Play menu.

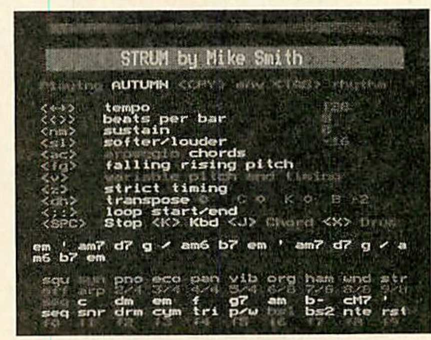
Rhythms that stick

While in Play mode, pressing TAB enters the interactive rhythm mode. This allows rhythms and drum patterns to be varied – while they are playing.

Below the menu, three lines of notes are displayed, showing the current rhythm notes, accents, and drum hits. Above them a red V indicates the note being edited. This can be moved left or right with a comma or a fullstop – not to be confused with the beats per bar setting which is changed with < and >, using SHIFT. The tempo is altered with the left and right cursor keys (with SHIFT for steps of 10) as before.

Chords are composed of seven notes, 1-7, plus 0 for a rest. The rhythm sequence for each chord can be up to 32 notes long, repeating the seven notes or the rest in any





order. A note is accented by pressing @ or not with /.

Normally, the seven notes are defined in ascending order of pitch and are determined by the chord name – 'Am7', 'F6' and so on – but could be any set of notes in a user-defined chord.

The unaccented drum hits are high snare (h), medium snare (m), low snare (l), bass drum (d), brush (r), cymbal (c), triangle (t), falling pitch (), rising white noise (w), bass (b), chord note (n) and rest (').

The drum hits are accented by pressing SHIFT as well. It is possible to mix any of the drum sounds in one pattern, including bass and chord notes or rests. Selecting chord notes plays the same note as the chord sequence but individual notes can be accented for rhythmic effect.

Also, the same note, if played in the chord, sounds on a different channel which results in interesting phasing effects and a richer timbre.

Bass notes also play the same note as the chord, but normally two octaves lower.

It is possible to toggle the chords off with the bass continuing to play. Any required bass line can then be set up on the rhythm sequence.

Pattern presets can be entered or edited on any function key by pressing the required one with CTRL for rhythms, or by itself for drums, while in Rhythm mode. First you have the option of changing the three letter name, pressing RETURN to continue.

Notes or hits can be added to the rhythm or drum sequence by moving the cursor to the next space after the last note and entering the required symbol. The cursor advances automatically.

The number of beats per bar will increase with the rhythm pattern only. Note that rhythms and drum patterns are extended independently, depending on the symbols entered.

A rhythm pattern can be shortened by DELETE, drum patterns by pressing SHIFT-DELETE. The number of beats per bar will reduce with the rhythm pattern only.

Pressing TAB returns to the Play menu.

Keynotes

Pressing K in the main menu allows a keyboard sequence of up to 512 beats to be recorded.

Before starting to record, four time signals are played. Keyboard notes are 'quantised' to the current tempo and beat and can take a little practice before you get your timing right! ESCAPE ends the recording. This ensures that rests are added to the keyboard sequence so it repeats from the start of any chord sequence when replayed or edited.

To replay your recording, press E from the main menu.

You can speed up or slow down the tempo, or change any of the Play parameters to alter the accompaniment.

Different instruments can be tried or other presets changed. You can edit your recording by playing new notes over the top of the original.

This is called 'punching-in' and requires some practice! A note can be deleted or shortened by pressing DELETE.

You can set up a short loop from the recording by pressing ';' at the start and ':' at the end.

The loop will repeat continuously, allowing editing until you are satisfied. Press SPACE to stop the loop and continue with normal replay.

The whole keyboard sequence will repeat automatically, from the start of any chord sequence but independently of drum sequences.

Pressing CTRL at the end of a keyboard sequence puts you back in record mode, and allows the sequence to be extended.

Pressing F from the main menu takes you into the chord editor. Press the function key chord you wish to edit. It will be highlighted and the cursor will flash ready for you to input the chord name.

Press RETURN to fix the new chord. If you want to define a chord, harmony or scale press K (or k). A table of pitches will be displayed and each of the seven notes can be entered.

'Micro-tones' of an eighth of a tone can be entered if required. Default chords can be reset by pressing TAB.

Pressing I, R or M from the main menu resets the default instruments, rhythms or drums and updates the function key table.

If you have changed any envelope parameters, rhythms or drum patterns and want to keep them you must save them first.

Menu masters

Finally, the main menu allows sequences and presets to be loaded or saved to disc. You can load or save everything associated with a particular recording or just the chord sequence, presets and any user-defined harmonies, drums sequence and presets, the keyboard sequence, the preset instruments or the preset rhythms. Star commands can also be issued at this stage.

The filenames should have no directory prefix added as this is done automatically to denote the type of file saved.

If the file is not on the disc when loading or already exists when saving, you will be told so. Use *DRIVE to change the data drive rather than adding a prefix to the filename.

Starting to Strum

To start 'strumming', it's best to first enter a chord sequence. This can be changed or added to and a song structure built-up with repeats as you compose.

Alternatively, enter the chords from a song sheet. Pad out bars with repeat chords if necessary as each chord will have the same number of beats. You can now play the sequence and experiment with tempo, beats per bar, arpeggio, chord and so on.

Different instruments can be tried and the sustain setting varied. Pressing COPY allows you to instantly change the envelope parameters and hear the effect.

Interval (in C)	semi-tone	note	M	m	M7	m7	7	+	-	s	6	9	11	13
D 16	27	7										•		•
	26													
C 15	25		•	•				•	•	•	•			
B 14	24				•									
	23					•	•						•	
A 13	22	6									•			•
	21							•						
G 12	20		•	•	•	•	•			•		•	•	
	19									•				
F 11	18	5								•			•	
E 10	17		•		•		•	•			•	•		•
	16			•		•			•					
D 9	15	4										•		•
	14													
C 8	13		•	•				•	•	•	•			
B 7	12				•									
	11					•	•						•	
A 6	10	3									•			•
	9							•						
G 5	8		•	•	•	•	•			•		•	•	
	7								•					
F 4	6	2								•			•	
E 3	5		•		•		•	•			•	•		•
	4			•		•			•					
D 2	3	1												
	2													
C 1	1		•	•	•	•	•	•	•	•	•	•	•	•

Table 1

Now press a function key for a bass line or any other percussion effect. The defaults are examples only and can be changed to anything you like by pressing TAB.

Any percussion effect can be entered into the drum pattern, mixing bass with snares, cymbal and the like, and a hit or a rest will be played on every beat. Change the preset drum patterns to suit your composition and use them in a drum sequence to match the chords.

Rhythm patterns can be matched to the drum patterns and, as up to 32 beats per chord are possible, quite complex structures can be entered. Use this mode with chords 'off' to compose some really funky bass lines!

For the 'solo' use the monophonic keyboard on the top two rows of keys. Press 's' to reduce the volume of the chord accompaniment and play away, with a different instrument or octave range if you wish.

When you are really good at it, record the solo and play back with changes to notes, instrument, timing, or accompaniment. Then everything can be saved to disc.

The whole program is designed to allow you to hear the effect of changes instantly, using single key-presses. At last, you can really play your Beeb!

It is worth noting that the sound of the BBC micro (and therefore from *Strum*) can be vastly improved by feeding the audio signal to a larger external speaker (8ohm) or even to a hi-fi amplifier. However, it is recommended that you should only attempt this if you know what you are doing!

HOW THE PROGRAM WORKS

After initialisation and the main menu display, there are two main loops – PROCplay and PROCstrum.

PROCplay steps through the chord sequence array c$(c%) – and the drum sequence array p%(pp%).

If a function key preset is pressed, the sequences are overriden by J% and K% respectively.

The seven chord notes are worked out by PROCchord(chord$), in accordance with table 1 and held in the array pitch%(J%,n%. The drum hits are held in perc$, which is chosen from the array seq$(K%) by PROCperc(d%).

The next loop, PROCstrum, is then called. This steps through the beats of each chord, checking if any key has been pressed, determining which chord notes to play, in sequence, unison or user-defined, sounding the notes with SOUND, and playing the drum hit with PROCdrum(d$) (where d$ is the n% character in perc$).

The timing is determined by setting TIME to zero and waiting until it reaches the value set by tempo%. Each time through the loop the SOUND channel is incremented to allow chords and arpeggios to 'overlap'. Duration of notes is independent of tempo.

If a key is pressed, it is dealt with by PROCpar(k%) which first checks any keyboard functions with PROCkbd(b%), then envelope or rhythm changes, then any presets and finally alters any of the Play parameters, if required.

PROCkbd(b%) checks whether a previous key is still being pressed by INKEY(-L%). L% is held in memory at kc%?N%, where N% is the position of the last key pressed in Keyboard$.

If recording or editing, the key pressed is held in memory at kb%?B%, where B% is the current beat.

If no key is being pressed or has been recorded, the keyboard note is silenced by a SOUND statement.

If the same key is still being pressed, the note continues indefinitely or if a key is pressed, a new note is started.

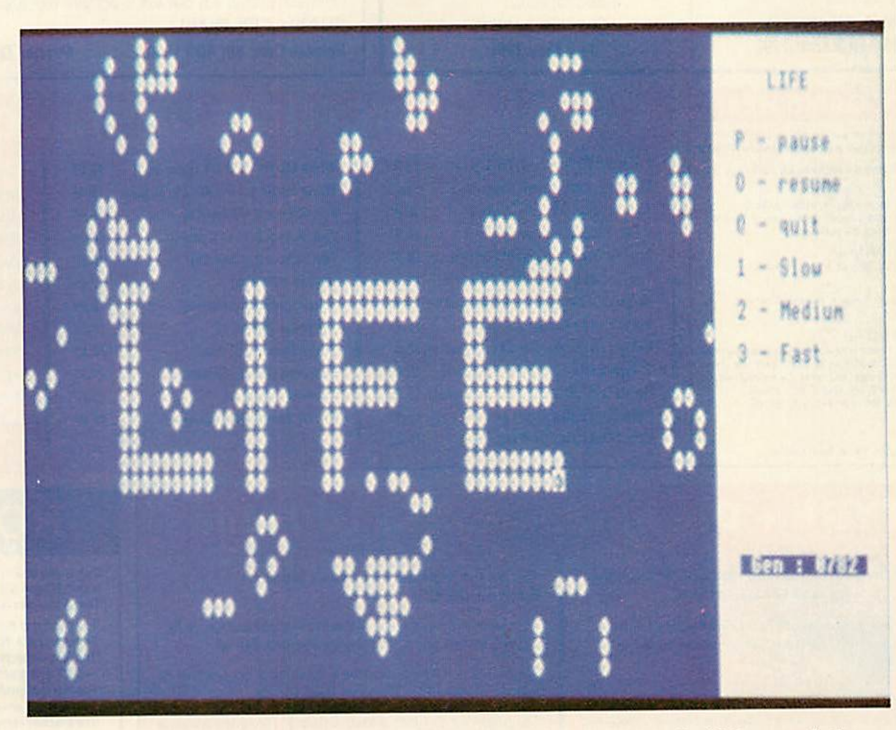
Drum hits are played by PROCdrum(d$). This uses channel 0. If the pitch parameter is 3 or 7, the pitch is determined by channel 1. Bass notes are obtained by adding 91 to the pitch of channel 1, giving a note two octaves below the chord notes playing at the same time.

The periodic waveform of channel 0 gives a nice funky bass sound that is quite realistic played through a good amplifier!

The instrument sounds are controlled by ENVELOPE statements stored in array e%(key%,par%), key% being the instrument currently selected, and par% being one of the 12 parameters necessary to define the ENVELOPE.

PROCvaryenv uses the cursor key codes to vary them. As they are then used by SOUND statements elsewhere in the program, the effect can be heard instantly.

PROCvaryrhythm uses similar interactive techniques on strings seq$, rseq$ and racc$ to vary drum, rhythm and accent patterns and allowing you to listen for the effect you want, rather than work it all out on paper first!



An old chestnut gets a new lease of life with a Beeb version from **PHIL BENDER** that's fast enough to make even the Archimedes sit up and take notice

BORN AGAIN

The 'game' of *Life* is an old idea dating back long before the arrival of the micro. There have been many BBC micro *Life* programs but most suffer from either a restricted size or a sluggish performance. This program has a field size of 64x32 and its speed depends on the number of cells on the screen.

With 500 cells it manages about eight generations a second. Ten synchronised gliders – 50 cells – run at an amazing 24 generations per second. The average is typically around 15-16 generations a second.

What is the secret of this speed? The conventional approach to *Life* is slow because it has to check the eight neighbours of each cell, on the off-chance there may be three and a new cell be born.

This method is based on the observation that a cell which is dead in the current generation can have no effect on the next generation.Consider two arrays, one called 'cells' (holding the live/dead flags for each cell) and the other 'votes'.

First zero the votes array, then for each generation, scan the cells array. If a live cell is found it 'casts a vote' for each of its neighbours by incrementing the appropriate locations in the votes array. Like a good politician it also votes for itself.

When all the cells have been polled scan the votes array. If a cell polls no votes it was dead and remains dead.

If a cell polls four votes it is either a live cell with three neighbours or a dead cell with four neighbours. In either case it remains unchanged, so clear its vote and skip it. If a cell polls three votes it is either a live cell with two neighbours or a dead cell with three neighbours, so zero its vote and if not already alive, mark as live and print it. In all other cases the cell must die so clear its vote and if not already dead mark as dead and delete it.

A bit of thought shows this is merely a restatement of Conway's rules incorporating the cell itself. The speed depends largely on the number of cells which change state.

The size of the field, 64x32, is not only convenient for display but means the two arrays are exactly 2K in size, making it easy to move between them. It also allows wraparound to be simply achieved by means of a bitwise AND – a speedy machine code alternative to Basic's MOD function. Specifically, where N% is a power of 2 (4,8,16...), X% MOD N% can be replaced by X% AND (N%-1), which is much faster.

Life time

So much for theory. First enter and run listing 1. This assembles and saves the machine code, which occupies most of pages &9 and &A – used only for tape sequential files (OPENOUT, etc), *SPOOL and *EXEC.

Next enter listing 2, the Basic control program. This sets up various variables, including a screen address lookup table in page &C but it is mainly concerned with editing the initial generation.

Most options are catered for but feel free to design your own cells – the last seven DATA items.

Having entered the program, it's time to test it. Enter a line of five cells.

Move down a row, and put one cell under the left-hand end. Move down another row, and put one under the right-hand end, and press RETURN.

This starting pattern sends colonies of cells swirling round the screen, emitting several gliders, until it reaches a stable configuration some 1200 generations later – less than 70 seconds in fast mode. Another ploy is to see how long a random start pattern will remain active.

My record is about 3100 generations (in a little over three minutes).

You could write a routine to save and load the start patterns. The easiest way would be to save the entire memory between HIMEM and &8000.

As a final thought, a native Arm code version of this algorithm should comfortably outrun the display!

For more details on this *Life* algorithm, see 'Life in the Fast Pool' by Steve Broderick in the August 1988 issue of *Program Now*.

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FREEDOM FIGHTER

Incredibly realistic combat action with the best (and the most) graphics and music yet seen on the Archimedes.

Produced by Peter Gillett, the author of the highly acclaimed Arcade Soccer, the game pitches you against horrendous odds. Using machine guns, rocket launchers and other weaponry you must blast the enemy troops, tanks and aircraft into oblivion to achieve your objective. Incredibly action packed

Release Date: 6th April 1990 **Price Below**

APOCALYPSE

Produced by Gordon Key the author of Holed Out and E-Type, this incredible new Archimedes game sets new standards of excellence in 3-dimensional solid graphics and digitised sound effects. Your overall task is to rescue a whole solar system from an evil dictatorship. Apocalypse is a feast for your eyes, ears and grey matter.

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Your opponents include beautifully detailed Porches, Lotuses, Audi Quattros etc. etc. (BBC and Electron versions are due for release in early May).

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"This is a superb game ... the tracks are fantastic." ... **The Times, Dec'89**

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Due to overwhelming public demand The 4th Dimension has now produced 2 volumes of extra courses for their superb 3D golf game Holed Out. Each volume contains 2 superbly designed brand new courses These courses are a lot trickier than the 2 courses which are on the original Holed Out!

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The fully enhanced Archimedes version is also now available.

"Will I keep playing it the way I've played Elite for years? And the answer is yes. Graphics 10, Playability 10, Value for Money 10" **The Micro User, Nov' 89.**

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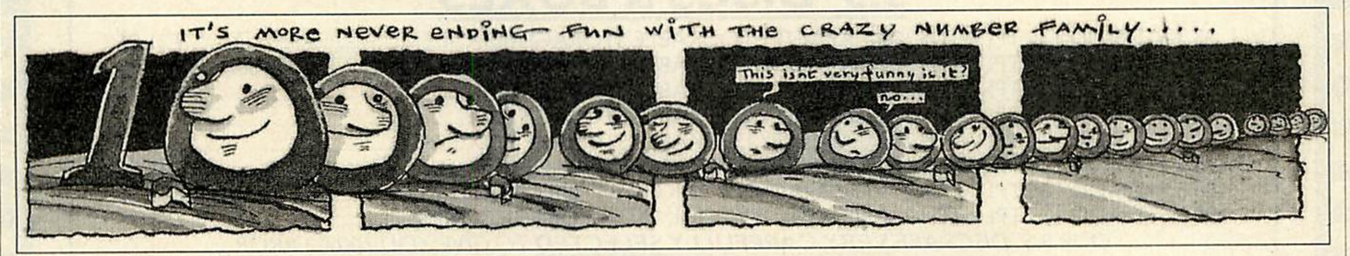
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When your computer can't manage any better than an old-fashioned handheld calculator, then you need to investigate this face-saving utility from **DAVID COOK**

PRECISION MADE



It is a frustrating fact that the BBC micro can only calculate on a limited number size, less in fact than most scientific calculators. This machine code arithmetic routine allows integer arithmetic to be performed on numbers up to 4095 digits long with absolute accuracy.

The commands are quite easy and correspond to those found on simple calculators but have been implemented as extra operating system commands (star commands) so they can be used within a Basic program.

The ability to use large numbers can be useful in many mathematical problems. Also the use of large whole numbers is becoming increasingly important in computer confidentiality as some codes involve the use of large prime numbers (such as the Rivest-Shamir-Adelman system) which make code breaking extremely time consuming and so effectively impossible.

Although only dealing with integer numbers, it is possible to use this routine to calculate real numbers (those with decimal fractions) provided the position of the decimal point can be determined by the control program. This is shown in the demonstration program which can calculate the square root of a number accurate to better than 2000 decimal places.

The routines are slow compared to the usual Basic arithmetic, despite being written in machine code, and complex calculations or repetitive loops involving large numbers can take many minutes or even hours to perform.

This is especially true of division which should be done as little as possible if maximum speed is wanted. The only exception to this is the separate command to divide the accumulator by 100 (*DAH) which is fast so it is much faster to multiply by 50 and divide by a hundred using *DAH than to divide by 2.

Dividing a 2000 digit number (9999999...9) by two takes over 10 minutes but multiplying by 50 and dividing by a hundred takes about a quarter of a second.

The program uses storage registers located from &1900 onwards.

This area is normally the start of Basic memory so the program requires PAGE to be reset to 18K (PAGE=18*1024) before loading and running the program.

A test is included to prevent the program overwriting itself.

Once installed the routines are very easy to use and can be accessed either in immediate or program modes.

The routines use several registers but only three need be considered by the programmer. The first of these is called A for accumulator. This holds one of the starting numbers of any routine and always holds the result of the calculation. It is located from &1900 to &28FF.

The second register (located from &2900 to &30FF) is called the X register and this holds the second starting number in any calculation but is unaltered at the end of the routine.

The third register (located from &3900 to &40FF) is called the Temporary, or T, register. This is used by several routines.

It is used by the division routine to hold the remainder after integer division, to pass numbers from Basic to the multiprecision A register and also during multiplication.

Each register has a set of pointers associated with it which indicates the size of the number. The index for the A register is a 2-byte number held at &72,&73 and this gives the length in bytes of the number in the A register. Each byte contains two digits so the length of the number is twice this length. The easiest way to read the number of digits is (?&72+?&73)*2.

The X register pointer is held at &76,&77 and the T register pointer at &7E,&7F.

All the instructions can be used in either direct mode or within a Basic program.

The only limitation is that each command must be the only command on a line as with other star commands.

The two registers, A and X, are called such to follow the pattern of 6502 assembler code. The result of any calculation is left in the accumulator and the X register is not changed.

All calculations are in positive integer arithmetic and there is no provision for decimal points.

The routines can be used to calculate decimals but the programmer must keep a check on the position of the decimal point. The new instructions can be of three types.

Ins and outs

Input and output commands allow input and output of the contents of the registers either from keyboard, disc or program.

*KBI allows direct input from the keyboard into the A register. Any number of digits up to 4095 can be entered. Entry is terminated as usual by a RETURN.

*PRA prints the contents of the A register to the screen and printer etc if active.

*SAVE is the normal operating system

Illustration by Simon Rees

command and has its usual syntax. If used with the appropriate addresses it will save the A or X registers. So, *SAVE <name> 1900 28FF saves the A register and *SAVE <name> 2900 30FF saves the X register. *LOAD is also the usual star command and reloads the appropriate register as above. Remember that these commands are operating system commands and cannot use variable names so if A$="FILE" then *LOAD A$ will only load a file named A$ and will not load FILE.

After loading, the pointers indicating the size of the number held must be reset using *RSX or *RSA as appropriate.

*STR allows a string of digits to be directly entered in Ascii decimal format. The numbers are poked directly into memory starting at &3900.

The string of numbers is terminated with a carriage return and then *STR is used to convert it into a number in the A register.

Up to 2047 digits can be entered in this way. It uses the same routine as keyboard entry but allows numbers to be calculated in Basic and transferred to the A register. For example:

```
1Ø a=1Ø*24+7
2Ø REM convert to Ascii
3Ø a$=str$(a)
4Ø FOR J= 1 TO LEN(a$)
5Ø REM inserts into Ram one
digit at a time
6Ø ?(J+&39ØØ)=ASC(MID$(a$,J,1))
7Ø NEXT J
8Ø ?(J+&39ØØ)=13
9Ø *STR
```

Memory tricks

The memory transfer commands rearrange the contents of the registers as follows:

*TAX transfers the contents of A into X. The previous contents of X are lost but the contents of A remain unchanged.

*TXA transfers the contents of X into A. The previous contents of A are lost but the contents of X remain unchanged.

*EXA switches the contents of the A and X registers without losing any data.

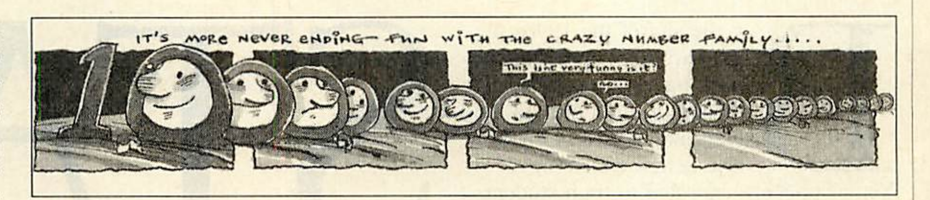
*ETA switches the contents of the A register and Temporary register holding the remainder after division.

*CLA clears the A register, while *CLX clears the X register. Registers should be cleared before loading.

*RSA resets the pointers for the A register. These indicate the number of digits held in the register and are used by the routines.The pointers must be updated after a LOAD and can be updated at any other time without harming the data in the register contents. *RSX resets the pointers for the X register.

Adding it all up

*ADD adds the contents of the X register to the A register and leaves the result in A. The contents of X are unaffected. *SUB subtracts the contents of the X register from the A register and leaves the result in A. The contents of X are unaffected.



*MXA multiplies the contents of the X register by the A register and leaves the result in A. The contents of X are unaffected.

*DXA divides the A register by the X register. The result of the integer division is left in the A register and any remainder is in the T (temporary) register and can be retrieved with *ETA.

No test is made for division by zero. If this occurs, the routine locks up and possibly destroys data and even the program.

*MAT multiplies the A register by 10 without affecting the X register which need not contain 10.

*DAH divides the A register by 100 without using the X register.

*CMP compares the X and A registers and stores the result in &8D and the result can be recovered using ?&8D. If A is more than X then &8D will return 1, if A equals X then &8D will return 0 and if A is less than X, &8D will return 255.

```
Ø1414213562373Ø95Ø488Ø16887242Ø9698Ø7856967
1875376948Ø73176679737990732478462107038850
38753432764157273501384623091229702492483605
585Ø737212644121497Ø9993583141322266592750
559275579995Ø5Ø1152782Ø6Ø57147Ø1Ø95599716Ø5
97Ø274534596862Ø1472851741864Ø8891986Ø95523
2923Ø4843Ø87143214508397626Ø3627995251407 98
968725339654633180882964062061525835239Ø54
74575Ø28775996172983557522Ø337531857Ø113543
746Ø34Ø84988471603868999706990Ø4815Ø3Ø544Ø2
779Ø316454247823Ø68492936918621580578463111
5966687130130156185689872372352885Ø92648612
49497715421833420428568606014682472077143 58
5487415565706967765372Ø226485447Ø158588Ø162
Ø7584749226572260Ø2Ø85584466521458398893944
37Ø9265918ØØ3113882464681570826301ØØ5948587
Ø4ØØ318648Ø342194897278290641Ø45Ø7263688131
3739855256117322Ø4Ø245Ø912277ØØ226941127573
62728Ø4957381Ø89675Ø4Ø1836986836845Ø7257993
647290607629969413804756548237289971803268Ø
247442Ø6292691248590521810Ø445984215Ø59112Ø
24944134172853147810580360337107730918286 93
1471Ø17111168391658172688941975871658215212
822951848847208969463386289156288276595 2635
14Ø5422676532396946175112916Ø24Ø871551Ø1351
5Ø4553812875600526314680171274Ø265396947Ø24
Ø3ØØ5174953188629256313851881634780Ø1569369
176881852378684Ø522878376293892143ØØ6558695
686859645951555Ø164472450983689603688732311
43894155766510408839142923381132Ø6052433629
4853170499157717562285497414389991880217624
3Ø9652Ø6564211827316726257539594717255934 63
7238632261482742622208671155839599926521176
252698917540988159348640Ø83457Ø851814722318
142Ø4Ø7Ø4265Ø9Ø5653233339843645786579679651
926729239987536661721598257886Ø263363617827
4959942194Ø377775368142621773879919455139 72
31274Ø668983299898953867288228563786977 4966
251996658352577619893932284534473569479 4962
952168891485492538904755828834526Ø96524Ø965
428893945386466257449275563819644103169 7983
3Ø61852Ø193793849400571563337205480685405 75
867999670121372239475821426306585132217 4Ø88
32382947287617393647467837431960ØØ15921888Ø
7347857617252211867490424977366929207311096
36972160893370866115673458533483329525 46758
51644710757848602463600834449114818587 65555
42864551233142199263113 32
```

Figures showing the square root of two – as produced by the example program

Using the program

As well as the multiprecision program itself, an example program is also included in the yellow pages.

This illustrates the use of the new commands with a calculation of the square root of 2 using Newton's algorithm.

This involves a decimal but since the approximate result is known (about 1.4) the integer routines can be used.

The algorithm is:

So, in Basic the program could read:

```
NEW APPROX=0.5*(APPROX+(NUMBER/2))
```

Using the multiprecision routines needs

```
1Ø B=1
2Ø REPEAT
3Ø A=B
4Ø B=(A+A/2)/2
5Ø UNTIL A=B
6Ø PRINT B
7Ø END
```

more program lines as composite equations must be broken down to single steps as with a calculator. The variables are stored on disc. Since we can't use decimals, we actually calculate the square root of 2x10^4088.

The first approximation of the root is 1x10^2044. Although the number 1x10^2044 can be entered directly (lines 100-130) the number 2x10^4088 must be calculated by entering 2x10^2044 and then multiplying by 1x10^2044.

Instead of dividing by 2 the number is first multiplied by 50 and then divided by 100 as this is much quicker. However, the program still runs slowly! It takes about a dozen lengthy iterations.

It does however eventually calculate the square root accurate to 2043 decimal places (the last digit is inaccurate it should be 3 not 2).

The program uses BCD (Binary Coded Decimal) arithmetic.

This is not often used in programs as it is wasteful of memory. Each byte of memory stores two decimal digits so a single byte can only store numbers from 0-99 instead of 0-255 in binary.

Each digit is stored in its half byte (or nibble) in normal binary form but the bit patterns 1010,1011,1100,1101,1110 and 1111 are not used in BCD (these correspond to A-F in hex).

If you wish to use the BCD directly then you must take care that these particular bit patterns do not get introduced or errors may creep in.

STAR GAZING

CHRIS DRAGE and **NICK EVANS** cast their eyes heavenwards and consult the skies on the future of IT in schools

By the end of the 1990s the educational environment will have changed completely, due not only to the National Curriculum but also to new technology. Yet schools are expected to train students to cope with new technology using ad hoc systems left over from the experimental days of the middle and late 1980s.

One should not underestimate the importance of those days because this was when many people discovered, studied and exploited the power of IT in the classroom: when resources, although never enough, were placed in the hands of potential users.

This situation really was ad hoc, simply because it was led by the technology and not by the curriculum. The question always asked was 'What can we do with this in the classroom?'.

Generally speaking we now know what we can do with this or that in a curriculum context and the question has become much more refined: 'With which software shall we do this most appropriately and on which machine?'

We are now experiencing a buyers' market and the results of this are currently being seen, especially in the context of local management of schools (LMS) which means that each school is to receive control of its own budget.

You will probably have noticed that both hardware and software producers are radically altering their strategies in order to redirect their efforts at individual schools, rather than at the computer centre advisers who have, against all the odds, borne the administrative brunt of testing, evaluating and licensing software for their regions.

The advisory service system has worked well and had major benefits for schools so there will inevitably be a period of adjustment while schools learn to flex their new-found financial muscle.

Primary school needs

So with all this freedom of choice, what should primary schools be standardising on over the next few years?

Well, they will need a computer which will do a wide variety of tasks, powerfully and prettily, complete with a good body of software and few user problems.

The Archimedes certainly fits this description. There is no other logical choice for a primary machine and the BBC A3000 is likely to become a standard in most authorities.

A minimum target must be one machine per classroom. One computer centre manager has said he feels that introducing extra single machines into that environment actually causes more problems than benefits.

Therefore, the next logical step must be to upgrade 'per class' each time. However, the financial logistics of this are beyond most primaries and it can only happen with national or local government support.



Yet in order to fulfil the National Curriculum it is particularly vital to increase levels of IT provision in primaries. Without it the degree of integration of IT into the curriculum and therefore the ability to achieve IT Attainment Targets will be reduced. There is still a battle to be fought, not just at primary level, with teachers who, through no fault of their own, have not yet acquired the skills of new technology.

Some of those who have just begun to come to terms with the BBC B and Master have suddenly had them snatched away and an Archimedes put in their place.

It's easy for those familiar with the Arc's user interface to assume that there is a minimal learning curve – that only comes after you've mastered three mouse buttons, indeed, the mouse itself, and worked out what all the spots, sliders and corners mean on the screen windows.

When the initial reaction is 'It looks a bit complex', it's difficult to get across that in fact it's ultimately much easier. So, as well as the kit, primary schools need basic training for many teachers.

Secondary school needs

The picture is different in secondaries, simply because the schools work differently.

Secondary schools are also going to be looking for a versatile machine. The Arc needs to be an artist, an information-handler, a document-processor and everything else but it's one of the few machines that can do all this well at all levels.

As the software base grows, so the need for equipment is going to grow. Schools will need a mix of provision: free-standing machines for individual use; computer rooms for groups; terminals in libraries and resource centres; workstations for graphic design, control technology and other design and technology tasks; MIDI interfaces and the power of the Arc to sample and synthesise sound in music departments.

Yes, but all that we know. What about the rest? There are significant issues relating to the ancillary equipment which complements the activities performed on the computer. Printers are a case in point.

The advent of 24-pin printers has left many people feeling dissatisfied with the old nine-pin variety. Quality and speed improvements mean more pupils can get to the system.

In addition, colour printing is a major issue. The debate about ink-jet versus colour ribbon never really got off the ground – you've only to look to see the difference. Therefore, the Integrex printer has become something of a standard. However, new machines like the Citizen Swift 24-pin printer with colour option comes in at under £300. It does everything you could want to a high quality and with the option to drive colour printing when necessary.

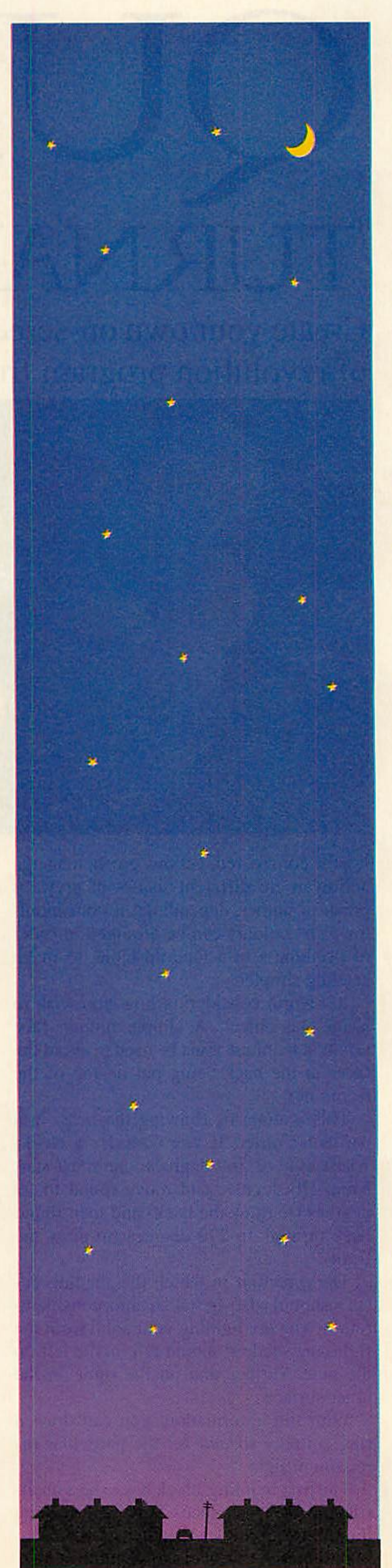
And then of course there is the laser printer. They used to cost around £6000 each but bottom of the range ones with limited fonts and no Postscript can come in under £1000.

Desktop publishing activities really demand that quality of output but how do you make sensible use of one laser printer in a comprehensive? Well, that's where your network comes in. Sharing that sort of resource for final print activities is a significant boon and when considered in the context of a school with, say, 20 Arcs, doesn't amount to a significant 'per machine' cost.

What other peripherals are going to be on the scene at the end of the decade? Certainly CD-Rom will be a main player.

It's relatively cheap, powerful, and discs can hold not just data but text, graphics, sound and even video.

The capability for schools and authorities to create their own CDs is not far away. Dedicated local authority historical study discs, geographical surveys of topography, demography and other features all interrelated with interactive OS maps and the capacity to update one's own findings opens up whole new worlds for learning and research. What about the software? Whereas schools, both primary and secondary, have traditionally gone for as much software as possible, covering topics as diverse as canal-building and drug abuse, the tendency is definitely away from large volumes of computer-aided learning (CAL).



This has been reinforced by the National Curriculum. There is still some room for the software which maps directly or partly on to those areas being exploited by teachers, and in a few years' time when the hiatus has passed, it seems likely that CAL will rise again.

Now, schools are after only one type of software – generic productivity tools.

The powerful multi-purpose product like *Pipedream* (Colton) was seen by some a year ago to be out of range of schools' budgets. *Pipedream* is now selling well into schools, despite its £100 price tag. Power, ease of use and quality are valuable commodities and, like all consumers, schools are willing to pay for them.

The end result of this, however, is that the number of software packages schools feel are necessary has diminished radically, both by choice and financial necessity. Specialised applications are still attracting attention but the main applications are being licensed by schools nationwide. This trend is likely to grow.

The interlude in which primary schools in particular are trying to run BBC Master software on their Arcs will pass fairly rapidly. Unfortunately, it is not sufficient to say, 'You should run eight-bit software on an eight-bit machine'. If you have no funds, or the software you want has not been completed, then what else can you do with the new machine?

In the next 12 months or so, primaries will find there is a wide selection of dedicated software available, and the major tools for them will come on stream, just as they did for the Beeb and Master.

So, with schools networked in order to share peripherals and data, laser printed output from all stations and CD-Rom libraries available at the touch of a button, what changes are likely to take place in the actual setup of the use of computers?

Will the Arc remain a standard? Many observers feel that the world is moving towards a uniform user-interface environment which will become a standard for many years. It is seen in part in Risc OS, in MS-Windows and in the Macintosh.

Acorn and others believe that this point on the horizon is Unix teamed with a windowing environment which gives users easy access to even more power.

Prospects are good and schools yet again are in an era of technological change. Anyone who thinks they will ever be in anything else has not read the stars correctly!

Illustration by Rob Miller

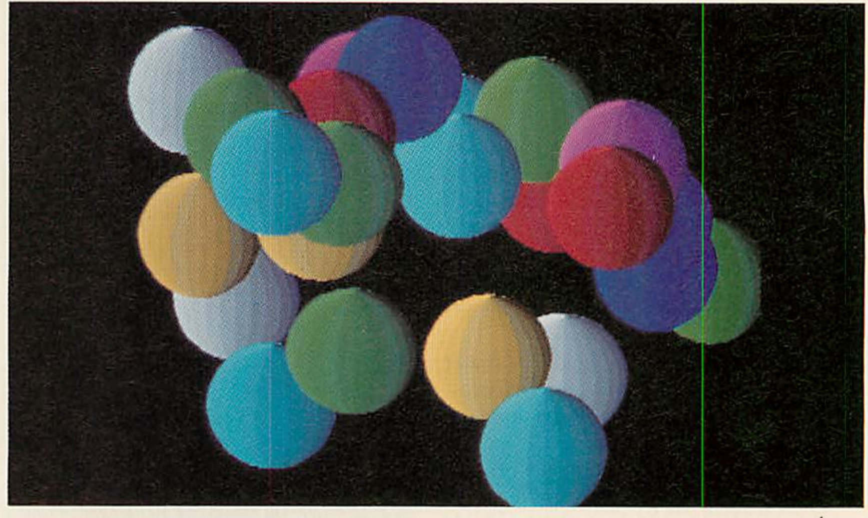
QUICK TURNAROUND

Create your own on-screen still life with this solids of revolution program from graphics guru **ROB MILLER**

If you remember Robert Robinson's weekly TV general knowledge quiz, *Ask The Family*, in which the Smiths would battle it out against the Jones to recognise oddly angled photographs, then you may remember the face-shaped vase at the start of the programme.

But what's this got to do with solids of rotation and what is one anyway? Imagine a potter at a wheel with a lump of clay. Suppose he was to take a pre-cut edge and use it to shape the clay while the wheel was turning. That pot is a solid of rotation.

Emulating the action of shaping a pot is quite simple on a computer. With a bit of maths, you can generate goblets, vases and bowls to your hearts content. There's also the added bonus of keeping your hands clean and, of course, no chance of your masterpiece flying off the wheel at the crucial moment.



Building blocks

A cylinder is used as the starting point and is best described as two equally sized ellipses and a series of straight lines. An ellipse can be drawn using a loop from 0 to 360 (or 0 to 2*PI if you were to use radians). Each point on the ellipse is defined as:

```
x=SINRAD(degree)*width
y=COSRAD(degree)*height
```

where degree is the loop variable and width and height are the respective width and height of the ellipse.

The following lines will draw an ellipse of any size at the position defined by centrex and centrey:

```
1Ø MODE 4
2Ø centrex=64Ø:centrey=512
3Ø ewidth=2ØØ:eheight=1ØØ
4Ø VDU 29,centrex;centrey;
45 MOVE Ø,eheight
5Ø :
6Ø FOR degree= Ø TO 36Ø
7Ø x=SINRAD(degree)*ewidth
8Ø y=COSRAD(degree)*eheight
9Ø DRAW x,y
1ØØ NEXT degree
```

A cylinder can be formed by changing the following program lines:

```
6Ø FOR degree=Ø TO 36Ø STEP 3Ø
7Ø MOVE x,y : DRAW x,y+4ØØ
```

Note the loop at line 60 has been changed to step in jumps of 30. This divides the cylinder into 12 'sides'. The top and bottom of the cylinder have been omitted, although these won't be necessary when the sides are drawn in solid.

What you have at the moment is just a wireframe outline of a cylinder. By filling in the faces with different colours, a more solid look can be obtained.

A shaded scale, for example black to white, gives a good effect. This is simple with the Arc, as it's just a case of selecting the shades from the palette.

With the Beeb, you must cheat a little by using a monochrome monitor and assuming the colours red, yellow, green, magenta and cyan are different shades of grey (or green or amber, depending on your monitor). The colours can be arranged in order of brightness in a look-up table, to make shading simpler.

It's worth considering how you wish to shade the object. A simple hidden face removal teqnique must be used to avoid the faces at the back being put on top of the front ones.

This is done by drawing the faces in a particular order. If you consider a clockwise circle of 360 degrees, one must start from 270 degrees and move round to 90 degrees (to draw the back) and then round back through to 270 degrees (to draw the front).

The direction in which the shading occurs should also be taken into consideration. If you are lighting your solid from the right, the shadow should fall on the left on the outer surface and on the right on the inner surface.

With this information, you can draw a ring suitably shaded for the particular direction of light.

The first building-block has to be a quadrilateral for each face. This is drawn by joining two triangles together.

It should be possible to position it anywhere on screen so it is defined by four sets of co-ordinates. The faces are then joined in an ellipse to form the ring – by joining pairs of points together in two adjacent ellipses like:

```
DEF PROCcylinder(ey1,ew1,ey2,ew2,pal)
:
FOR D=-9Ø TO (27Ø-step) STEP step
:
h1=w1/4:h2 = w2/4
x1=SINRAD(D)*ew1:y1=(COSRAD(D)*h1)+ey1
x2=SINRAD(D+step)*ew1:y2=(COSRAD(D+step)*h1)+ey1
x3=SINRAD(D)*ew2:y3=(COSRAD(D)*h2)+ey2
x4=SINRAD(D+step)*ew2:y4=(COSRAD(D+step)*h2)+ey2
:
PROCquad(x1,y1,x2,y2,x3,y3,x4,y4)
NEXT D%
:
ENDPROC
```

ew1 and ew2 represent the width of the top and bottom ring. The height of each ellipse is kept at one quarter of the width to give an effect of looking slightly down on the solid.

The heights are defined as h1 and h2 respectively. Changing the ratio between the width and height of the ellipse will change the appearance of the solid.

Setting the height to zero will give a straight side-on view although setting it to be equal with the width won't necessarily tilt the solid through 90 degrees. The variable, pal, controls the direction of the shading.



Shady dealings

Shading is achieved by using a selection of shades from left to right or vice versa depending on which way the shadow falls. On the Beeb the eight colours in mode 2 are used and these are ordered in an array first to make selection simpler.

Because you are using eight colours, the ring should be divided into 16 faces (eight for the front and eight for the back).

The main loop in PROCcylinder therefore jumps in steps of 360/16 = 22.5.

If you define a step to equal (360/(no. of shades*2)), the colour of a face can be found at any point on the ellipse with col((D%+90) DIV step).

When drawing a complete solid, such as a goblet, you have to take into account whether the inside of a surface will be visible or not.

If it is, the shadow will be reversed on the inside. So, you need to be able to reverse the palette when drawing the front of the ring.

By using the variable pal and checking whether the main loop is greater than 90 (front or back) the colour selection line becomes:

```
IF pal=2 AND D>9Ø THEN GCOL Ø,7-col((D+9Ø) DIV step) ELSE GCOL Ø,col((D+9Ø) DIV step)
```

Listing 1 in the yellow pages contains the whole program to draw a goblet in mode 2 on a BBC micro. Lines 130 to 250 contain the definition of the goblet shape.

Note that lines 180 to 220 define a half-sphere by calculating the values for ew1, ew2, eh1 and eh2. Any shape can be defined by substituting your own lines.

A shade more solid

With the Archimedes, you can use 256 colours at any one time and because of the way the colours are arranged in 256 colour modes, it is possible to have up to seven colours of 12 shades each, all on screen at once.

A simple routine can be devised to select the desired colours from the palette.

The colour numbering on the Archimedes is quite complex. Two bits are used per blue, green and red level, plus two bits for the brightness. So, a colour is defined as:

```
colour% = (blue%<<4)+(green%<<2)+red%
```

If you wanted magenta (a combination of blue and red) you would calculate it as:

```
magenta = (3<<4)+(Ø<<2)+3 = 48+Ø+1 = 49
```

a<<b is a binary operation and means shift a by b places to the left.

Any colour can have an asociated TINT value of 0-255. There are in fact only four distinct levels of brightness so it is more common to use the values 0, 64, 128 and 192 for tints. The desired colour is now selected by:

```
GCOL colour%
TINT tint%
```

It's now unnecessary for a look-up table as you have a method of calculating any colour.

By some simple maths, seven scales of colour (white, red, yellow, green, blue, cyan and magenta) can be selected.

Black is not used as its appearance on the computer screen is much too dark to be of any use.

Drawing a ring on the Archimedes is just a case of working out which colour and tint a particular face should be at any point on the ellipse. The colour can then be calculated like so:

```
colour = ((D%+9Ø) DIV 6Ø) MOD 3)+1
```

and the tint like so:

```
tint% = ((D%+9Ø) DIV 15)*64
```

r%, g% and b% are used to allow the 'switching on or off' the three primary colours.

If you wanted a magenta scale, the green level should always be zero, so g% is set to 0 when the colour selection routine is called.

The colour selection routine then becomes:

```
red%   = ((((D%+9Ø) DIV 6Ø) MOD 3)+1)*r%
green% = ((((D%+9Ø) DIV 6Ø) MOD 3)+1)*g%
blue%  = ((((D%+9Ø) DIV 6Ø) MOD 3)+1)*b%
tint%  = ((D%+9Ø) DIV 15)*64
```

The palette can be 'inverted' for shading inside surfaces by subtracting each of the colour levels from 2.

The maths for the Archimedes program is identical to that of the Beeb version. Listing 2 on the yellow pages draws one of the famous 10 green bottles using 12 shades of green on the Arc.

As it stands, designing a shape takes some experimentation.

An obvious solution would be to set up an array to store the outline.

This could in turn be edited and updated using a simple line drawing program. Such a routine would be simple to append to the main program.

Another idea I've considered is mapping pictures onto the sides of objects.

By dividing the outline of a shape into small enough sections, it should be possible to stick a full screen onto the side of the goblet.

The two programs on the yellow pages in this issue, together with these suggestions, should encourage you to pursue your own ideas on the subject and we look forward to hearing from you about any enhancements or ideas you may have.

READING MATTER

Transferring an old collection of Beeb discs into an Archimedes is a daunting task unless, like **DAVE LAWRENCE**, you have a program to do all the work for you

Many years ago, before the world was aware of things like Arms, Risc OS and ADFS, I owned a standard, unexpanded BBC model B. Many a long night was spent slaving over a hot tape recorder attempting to load or save my latest program.

After a couple of years, I decided enough was enough and went out to buy a disc upgrade for my trusty Beeb.

At that time, there were numerous companies offering such an expansion. Acorn and Watford Electronics both offered a DFS based around the rare (and expensive) 8271 disc controller.

The other options available used the more up-to-date WD1770 controller, which was smaller, cheaper and above all easily available.

It also had the advantage of supporting double density discs, allowing 640K to be crammed onto one disc.

Solidisk and Opus were the main contenders at the time (but who remembers the Kenda 'bar of chocolate' bodge board?).

The only potential problem of using one of these products was one of compatibility – would protected games still run correctly?

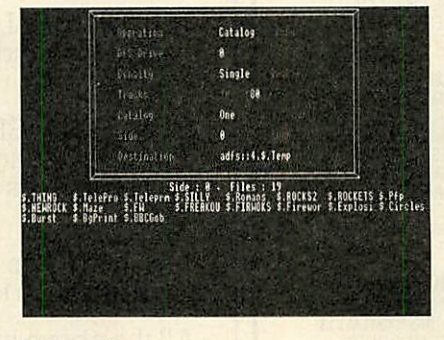
In the end, I opted for the Solidisk DDFS board which offered double density discs, unlimited file names per catalogue and a high degree of compatibility. (I later upgraded to its DFDS board, which held an 8271 as well as the 1770).

What I didn't foresee was the untimely death of my faithful Beeb but as by then I had an A440, I simply left my cache of old BBC software gathering dust in the corner.

Inevitably, the day recently arrived when I needed a program from one of my old discs, so I dutifully connected up all the relevant hardware to my Archimedes to read a 5.25in disc only to find the disc in question was in Solidisk double density extended catalogue format – unreadable by any of my DFS reader programs.

What ensued was an evening of frenzied button pressing and tea drinking with the *CopyDFS* program on the yellow pages as the outcome. This is capable of cataloguing and copying programs from a DFS disc into an ADFS directory on the Arc.

It will happily deal with Acorn discs, super-dooper double extended Solidisk ones and with the old faithful 62-file Watford variety.



Using the program

First type in the program, save it somewhere and run it.

You will be presented with a box in the middle top of the screen containing seven options.

You can move between these using the up and down cursor keys.

The left and right cursor keys are used to change the option settings.

Most of these should be fairly self explanatory and a little experimentation should give you the feel of the program.

The only other keys you need to know about are RETURN (which means go!)SHIFT-ESCAPE (which quits the program) and A, S and W.

These last three have been defined to set the first six options to appropriate values for reading Acorn, Solidisk and Watford discs respectively.

The Destination field should be filled in with the full pathname of the directory in which you wish to copy the DFS disc. It is not necessary to have previously created this directory.

If you ask the program to copy both sides of the Beeb disc, two further sub-directories Side0 and Side1 will be created.

Cataloguing discs

To catalogue a DFS disc set the drive, density, tracks, catalogue and side as required and set 'Operation' to 'Catalogue'. Don't forget you can use A, S or W if appropriate. Note the Destination directory is not needed, simply press RETURN.

The side number and number of files will be displayed along with a tabulated list of the files.

The program will then beep and wait for any key to be pressed before continuing.

Copying discs

To copy a DFS disc, proceed as for cataloguing but set 'Operation' to 'Copy' before pressing RETURN.

If there is anything wrong with the destination directory, you'll be informed and not allowed to continue until a valid name is entered.

If necessary, you'll be asked if you want to create the destination directory.

Once the program is happy with this, the file list will appear and the files will be copied. Each file is highlighted in green when read and red when written(!)

Single character sub-directories are created when necessary and illegal characters within ADFS filenames are changed to a '?' One slight problem comes when the destination directory becomes full.

There does not seem to be a SYS call to determine the number of entries left in a directory and it is not possible to read the number of existing files and subtracting it from the maximum number of files as this varies between filing systems and even between disc formats.

As a compromise, if the program finds a directory full, it deletes the last file it saved, creates a sub-directory called !!More then starts copying again from the previous file (the one just deleted) into this new directory.

Extensions

I have kept the program relatively short for the magazine but it is quite possible to add such luxuries as selective file copying, file investigation and even the ability to read other disc formats such as Opus or Watford double density. Those, I'll leave to you.

PROCinit	Set up variables and arrays
PROCset	Set options to one of three defaults (Acorn, Solidisk or Watford)
PROCerror	Deal with any errors
FNnaughty	Inform user of bad directory names
PROCwipe	Clear lower screen area
PROCdo	Display an option and its settings
PROCbox	Draw a bordered box
FNvariables	Accept key presses and update options
PROCsetparams	Set up information to read disc
PROCcopydisc	Copy a disc
PROCreadcat	Read the files of a disc side and use PROCstore to save their file information.
PROCget	Retrieve information for a given file
PROCshowcat	Display tabulate list of file names
PROCcopycat	Copy files to ADFS, creating further directories as necessary
FNsetblock	Set up a disc record to read single density discs. (Double density ones can be read directly with ADFS_DiscOp)
PROCread	Read some bytes from a given drive, side, track and sector

Table 1 Summary of FNs and PROCs

MORE NEW RELEASES FROM DABS PRESS

Z88 PipeDream: A Dabhand Guide

Z88

from John Allen - expert Z88 journalist

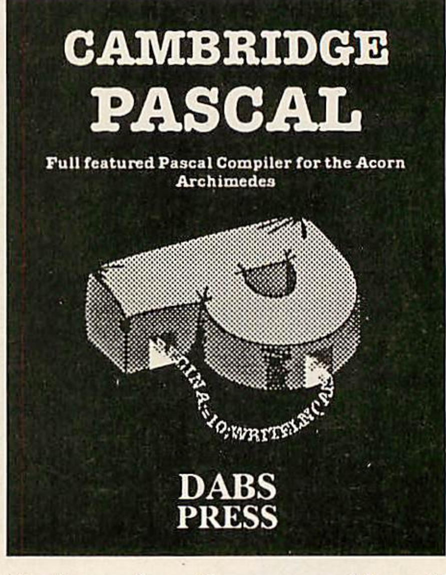
PipeDream, the built in word processor, spreadsheet and database built into the Z88 is an extremely powerful tool, and John Allen, author of many articles of the Z88, and experienced user has produced what must be the ultimate tutorial and reference work on the software. With many example documents and templates, this book takes you from first principles to a thorough understanding of the program. Linking to PipeDream on other machines such as the BBC and Archimedes is also covered.

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Cambridge Pascal is a comprehensive version of the Pascal language and includes many extra enhancing features over the standard specification including full dynamic string handling, local error handling, random access files, direct access to 'star' commands and RISC OS SWI calls. It is 100% Desktop compatible but can also be run from the command line. All programs compile into fast, efficient machine code.

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ARCHIMEDES FIRST STEPS

Beginners Guide to the Archimedes & BBC A3000

This book is the perfect introductory guide to the Archimedes, to guide you through the first few months of ownership, acting as an easy-to-read supplement to the User Guide.

The book describes in detail how to put the RISC OS Desktop to best use, and also documents the programs on the Applications Discs provided with the machine.

But the book also goes beyond this and describes the sort of software and hardware additions available to the Archimedes owner, and how to choose and install them.

The many features of this book include:

- Applicable to all Archimedes with RISC OS
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COMPATIBILITY

Program	Page	BBC B	B+/128	Master 128	Master Compact	Electron	Arc	6502SP/ Turbo	ADFS	Econet	Shadow RAM	Monthly Disc
Music	17											
Listing 1		■	■	■	■				■	■	■	■
Risc Revue	30											
Listings 1-6							■		■	■	■	■
Eight Bits	58											
Listings 1-2		■	■	■	■	■		■	■	■	■	■
Listings 3-4(1)		■	■	■					■	■	■	■
New Modes	64											
Listings 1-4							■		■	■	■	■
Strum	66											
Listing 1		■	■	■	■			■	■	■	■	■
Life	73											
Listings 1-2		■	■	■	■			■	■	■	■	■
Multi Precision	75											
Listings 1-2		■	■	■	■			■	■	■	■	■
Pottery	81											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Listing 2							■		■	■	■	■
Discs	83											
Listing 1							■		■	■	■	■

Note: (1) requires 512 second processor

MUSIC

Listing 1

```
   10 REM Music 5ØØØ Sample Player
   20 REM by Hybrid Technology
   3Ø REM for B/B+/M/C
   4Ø REM BAU May 199Ø
   5Ø :
   6Ø REM Initialises synthesiser to con
tinuously output through its DAC
   7Ø REM the value of a single register
  written by the driving program.
   8Ø CLS
   9Ø PRINT "Direct-DAC access on Music
5ØØØ"
  1ØØ :
  11Ø wavelen=2^8 : REM 2^n, where n is
integer - smaller n can be used
  12Ø linrange=128:dacbits=7:dacfracbits
=4
  13Ø DIM code% 1ØØØ, wave wavelen,logta
ble linrange
  14Ø :
  15Ø PRINT "please wait..."
  16Ø :
  17Ø PROCass(code%,Ø):PROCass(code%,2)
  18Ø PROCinitsynth:PROClogtab
  19Ø :
  2ØØ PRINT "making sine wave..."
  21Ø FOR I%=Ø TO wavelen-1
  22Ø val=127*SIN(((I%/wavelen+1))*2*PI)
  23Ø wave?I%=ABS(val) OR (SGN(val) AND
&8Ø)
  24Ø NEXT
  25Ø PROCplay
  26Ø :
  27Ø PRINT "making 'FM brass' wave..."
  28Ø FOR I%=Ø TO wavelen-1
  29Ø val=127*SIN(((I%/wavelen+1)^2.5)*2
*PI)
  3ØØ wave?I%=ABS(val) OR (SGN(val) AND
&8Ø)
  31Ø NEXT
  32Ø PROCplay
  33Ø :
  34Ø PRINT "making ramp wave..."
  35Ø FOR I%=Ø TO wavelen-1
  36Ø val=127*(I%/(wavelen DIV2)-1)
  37Ø wave?I%=ABS(val) OR (SGN(val) AND
&8Ø)
  38Ø NEXT
  39Ø PROCplay
  4ØØ :
  41Ø PRINT "making square wave..."
  42Ø FOR I%=Ø TO wavelen-1
  43Ø val=127*(I%/(wavelen DIV2)-1)
  44Ø wave?I%=&7F OR (SGN(val) AND &8Ø)
  45Ø NEXT
  46Ø PROCplay
  47Ø :
  48Ø PRINT "making pulse wave..."
  49Ø FOR I%=Ø TO wavelen-1
  5ØØ wave?I%=&7F OR (&8Ø AND (I%>(wavel
en/8)))
  51Ø NEXT
  52Ø PROCplay
  53Ø :
  54Ø PRINT "finished."
  55Ø END
  56Ø :
  57Ø DEF PROCplay
  58Ø PRINT "playing single tone..."
  59Ø PROCsetfreq(5ØØ):A%=255:CALLplay
  6ØØ d=INKEY(1ØØ)
  61Ø PRINT "playing rising sequence..."
  62Ø d=INKEY(1ØØ)
  63Ø thisfreq=1ØØ
  64Ø REPEAT thisfreq=thisfreq*2^(1/6):P
ROCsetfreq(thisfreq)
  65Ø A%=thisfreq/1Ø
  66Ø CALL play
  67Ø UNTIL thisfreq>255Ø
  68Ø d=INKEY(1ØØ)
  69Ø PRINT "playing 'computer speech'..
."
  7ØØ d=INKEY(1ØØ)
  71Ø FOR I%=Ø TO 24:PROCsetfreq(RND(4ØØ
Ø)+4ØØ):A%=5Ø:CALL play:NEXT
  72Ø ENDPROC
  73Ø :
  74Ø DEF PROCsetfreq(f%):!freq=f%*(wave
len/256)
  75Ø ENDPROC
  76Ø :
  77Ø DEF PROCass(P%,opt%)
  78Ø [OPT opt%
  79Ø \ variables
  8ØØ .icount EQUB Ø
  81Ø .phase EQUD Ø
  82Ø .freq EQUD Ø
  83Ø :
  84Ø .play \ play test sound fcr A supe
r-cycles (cycles * 256/wavelen)
  85Ø :
  86Ø SEI
  87Ø STA icount
  88Ø .innerloop
  89Ø \ evealuate next sample from digit
al oscillator
  9ØØ LDA phase:CLC:ADC freq:STA phase
  91Ø LDA phase+1:ADC freq+1:STA phase+1
  92Ø PHP \ store end-of-cycle flag (C)
  93Ø :
  94Ø \ transform into currect wave shap
e
  95Ø AND #wavelen-1:TAX:LDA wave,X
  96Ø :
  97Ø JSR sendA
  98Ø :
  99Ø PLP
 1ØØØ \CLI:\RTS
 1Ø1Ø BCC innerloop                \ end of
 super-cycle?
 1Ø2Ø DEC icount:BNE innerloop  \ end of
 note?
 1Ø3Ø CLI
 1Ø4Ø :
 1Ø5Ø RTS
 1Ø6Ø :
 1Ø7Ø \\\ BELOW THIS LOADLOMEM, BASIC AN
D ASSEMBLER ROUTINES FOR GENERAL USE \\\
 1Ø8Ø \\\ general code sequence for send
ing A to DAC \\\
 1Ø9Ø .sendA
 11ØØ \ convert A into logarithmic form
for sending to synthesiser
 111Ø TAX:ROL A:TXA               \ put si
gn bit in carry
 112Ø AND #&7F                    \ Remove
 sign bit
 113Ø TAX
 114Ø LDA logtable,X              \ Conver
t to log
 115Ø ROR A                       \ Put si
gn bit back on
 116Ø :
 117Ø STA &FDØØ                   \ output
 to synthesiser
 118Ø RTS
 119Ø :]:ENDPROC
 12ØØ :
 121Ø DEF PROClogtab
 122Ø linscale=(2^(2^(dacbits-dacfracbit
s))-1)/linrange
 123Ø logscale=2^dacfracbits/LN2
 124Ø FOR I%=Ø TO linrange-1:logtable?I%
=logscale*LN(I%*linscale+1)*2:NEXT
 125Ø ENDPROC
 126Ø :
 127Ø DEF PROCinitsynth
 128Ø ?&FCFF=&3E
 129Ø FOR I%=&FDØØ TO &FDFF:?I%=&2:NEXT
 13ØØ FOR I%=&FDØØ TO &FDFF:?I%=&Ø:NEXT
 131Ø PROCset(&FD7Ø,&D)
 132Ø PROCset(&FD5Ø,Ø):PROCset(&FD6Ø,&8Ø
)
 133Ø PROCset(&FDØØ,&FE):PROCset(&FD2Ø,&
8Ø)
 134Ø PROCset(&FDØØ,1):PROCset(&FD1Ø,Ø):
PROCset(&FD2Ø,Ø)
 135Ø ?&FCFF=&3Ø
 136Ø ENDPROC
 137Ø :
 138Ø DEF PROCset(addr%,data%)
 139Ø FOR A%=Ø TO 128 STEP 128
 14ØØ addr%?A%=data%
 141Ø NEXT
 142Ø ENDPROC
```

RISC REVUE

Listing 1

```
  1Ø REM >SphereGen (RR1)
  2Ø REM Create sphere sprite
  3Ø REM by Philip Armstrong
  4Ø REM for Archimedes only
  5Ø REM (c) BAU May 199Ø
  6Ø :
  7Ø MODE 9
  8Ø PROCgreys
  9Ø r%=35
 1ØØ ox%=r%
 11Ø oy%=r%
 12Ø sp%=&2E
 13Ø SYS sp%,9
 14Ø SYS sp%,15,,"Ball",Ø,r%/2+1,r%/2+1
,9
 15Ø SYS sp%,29,,"Ball"
 16Ø SYS sp%,6Ø,,"Ball" TO RØ,R1,R2,R3
 17Ø r2%=r%*r%
 18Ø FOR Y%=r% TO-r% STEP -4
 19Ø AY%=(DEG(ASN(Y%/r%))-24)^2
 2ØØ x%=SQR(r2%-Y%*Y%)DIV4*4
 21Ø FOR X%=-x% TO x% STEP 4
 22Ø c%=SQR((DEGASN(X%/r%)-24)^2+AY%)/8
+RND(1)
 23Ø IF c%>14 GCOL Ø,15 ELSE GCOL Ø,c%+
1
 24Ø POINT ox%+X%,oy%+Y%
 25Ø NEXT
 26Ø NEXT
 27Ø FOR X%=Ø TO 2*r% STEP 4
 28Ø FOR Y%=Ø TO 2*r% STEP 4
 29Ø IF POINT(X%,Y%)=Ø SYS sp%,44,,"BAL
L",X%/4,Y%/4,Ø
 3ØØ NEXT
 31Ø NEXT
 32Ø SYS sp%,RØ,R1,R2,R3
 33Ø *SCHOOSE Ball
 34Ø GCOL 8,Ø
 35Ø PLOT &ED,5ØØ,5ØØ
 36Ø PLOT &ED,55Ø,55Ø
 37Ø save$="Ball"+STR$(MODE)
 38Ø OSCLI"SSAVE "+save$
 39Ø PRINT"Sprite saved as '"save$"'"
 4ØØ END
 41Ø :
 42Ø DEF PROCgreys
 43Ø FOR c%=Ø TO 15
 44Ø a%=(15-c%)*16
```

Continued ▶

RISC REVUE

◀ Continued

```
450 COLOUR c%,a%,a%,a%
460 NEXT
470 ENDPROC
```

Listing 2

```
10 REM >SphereDemo (RR2)
20 REM 3D Demonstration
30 REM by Philip Armstrong
40 REM for Archimedes only
50 REM (c) BAU May 1990
60 :
70 ON ERROR MODE 0:PRINTREPORT$,ERL:END
80 pnts%=40
90 zcutoff%=10
100 MODE 9+128
110 IF MODE=12 OR MODE=9 PROCgreys
120 DIM x%(pnts%),y%(pnts%),z%(pnts%)
130 DIM x1%(pnts%),y1%(pnts%),z1%(pnts%)
140 ssize%=&FBB
150 DIM sp ssize%
160 !sp=ssize%
170 sp_Op=46
180 DIM scale 16
190 N%=1
200 PROCswap
210 CLS
220 PROCswap
230 sp!4=0
240 sp!8=16
250 sp!12=16
260 file$="Ball"+STR$MODE
270 spr$="Ball"
280 SYS sp_Op,266,sp,file$
290 ORIGIN 640,512
300 OFF
310 PROCinit
320 MOUSE ON 0
330 REPEAT
340 MOUSE y1%,x1%,B%
350 c$=INKEY$(0)
360 C%=ASC(c$)-48
370 IF C%>0 AND C%<7 sh%=C%
380 PROCnew
390 ss%=4
400 CASE TRUE OF
410 WHEN INKEY(-10):zp%-=ss%
420 WHEN INKEY(-12):zp%+=ss%
430 WHEN INKEY(-26):xp%+=ss%
440 WHEN INKEY(-122):xp%-=ss%
450 WHEN INKEY(-42):yp%+=ss%
460 WHEN INKEY(-58):yp%-=ss%
470 ENDCASE
480 time%=TIME
490 PROCrotate
500 CLS
510 PROCplot
520 PRINTTAB(0,0);(TIME-time%)/100;" Shape ";sh%
530 PROCswap
540 UNTIL FALSE
550 END
560 :
570 DEF PROCinit
580 x1%=0:y1%=0:z1%=0
590 xp%=0:yp%=0:zp%=100
600 pros%=1000
610 scale!8=100
620 scale!12=100
630 size%=6
640 sh%=1
650 PROCnew
660 ENDPROC
670 :
680 DEF PROCrotate
690 FOR I%=1 TO PT%
700 c=COSRAD(z1%)
710 s=SINRAD(z1%)
720 x2%=x%(I%)*c-y%(I%)*s
730 y2%=y%(I%)*c+x%(I%)*s
740 c=COSRAD(y1%)
750 s=SINRAD(y1%)
760 z2%=z%(I%)*c+x2%*s
770 x2%=x2%*c-z%(I%)*s
780 c=COSRAD(x1%)
790 s=SINRAD(x1%)
800 t%=y2%
810 y2%=y2%*c-z2%*s
820 z2%=z2%*c+t%*s
830 x1%(I%)=x2%+xp%
840 y1%(I%)=y2%+yp%
850 z1%(I%)=z2%+zp%
860 NEXT
870 PROCsort
880 ENDPROC
890 :
900 DEF PROCplot
910 FOR I%=1 TO PT%
920 IF z1%(I%)>zcutoff% THEN
930 IF z1%(I%)=0 fact=pros%/0.1 ELSE fact=pros%/z1%(I%)
940 S%=fact/size%*100
950 scale!0=S%
960 scale!4=S%
970 SYS sp_Op,308,sp,spr$,(fact*x1%(I%)),(fact*y1%(I%)),8,scale
980 ENDIF
990 NEXT
1000 ENDPROC
1010 :
1020 DEF PROCswap
1030 SYS 6,113,N%
1040 N%=N% EOR 2+1
1050 SYS 6,112,N%
1060 ENDPROC
1070 :
1080 DEF PROCsort
1090 FOR I%=1 TO PT%-1
1100 T%=z1%(I%)
1110 P%=I%
1120 FOR J%=I%+1 TO PT%
1130 IF z1%(J%)>T% T%=z1%(J%):P%=J%
1140 NEXT
1150 SWAP z1%(I%),z1%(P%)
1160 SWAP x1%(I%),x1%(P%)
1170 SWAP y1%(I%),y1%(P%)
1180 NEXT
1190 ENDPROC
1200 :
1210 DEF PROCgreys
1220 FOR C%=0 TO 15
1230 A%=(15-C%)*16
1240 COLOUR C%,A%,A%,A%
1250 NEXT
1260 ENDPROC
1270 :
1280 DEF PROCnew
1290 PT%=0
1300 rad%=30
1310 CASE sh% OF
1320 WHEN 1:PROCplane
1330 WHEN 2:PROCdisc(0)
1340 WHEN 3:PROCdisc(1)
1350 WHEN 4:PROCshapes(0,359,90,90,359+90,180)
1360 WHEN 5:PROCshapes(0,359,60,0,359,60)
1370 WHEN 6:PROCreaddata
1380 ENDCASE
1390 ENDPROC
1400 :
1410 DEF PROCplane
1420 FOR X%=-30 TO 30 STEP 30
1430 FOR Y%=-30 TO 30 STEP 30
1440 PT%+=1
1450 x%(PT%)=X%
1460 y%(PT%)=Y%
1470 z%(PT%)=0
1480 NEXT
1490 NEXT
1500 ENDPROC
1510 :
1520 DEF PROCdisc(f%)
1530 FOR A=0 TO 359 STEP 30
1540 PT%+=1
1550 x%(PT%)=rad%*SINRAD(A)
1560 y%(PT%)=rad%*COSRAD(A)
1570 z%(PT%)=0
1580 IF A<>0 AND A<>180 AND f% PT%+=1:z%(PT%)=x%(PT%-1):y%(PT%)=y%(PT%-1):x%(PT%)=0
1590 NEXT
1600 ENDPROC
1610 :
1620 DEF PROCshapes(b1%,f1%,s1%,b2%,f2%,s2%)
1630 FOR A=b1% TO f1% STEP s1%
1640 PT%+=1
1650 x%(PT%)=rad%*SINRAD(A)
1660 y%(PT%)=rad%*COSRAD(A)
1670 z%(PT%)=0
1680 NEXT
1690 FOR A=b2% TO f2% STEP s2%
1700 PT%+=1
1710 z%(PT%)=rad%*SINRAD(A)
1720 y%(PT%)=rad%*COSRAD(A)
1730 x%(PT%)=0
1740 NEXT
1750 ENDPROC
1760 :
1770 DEF PROCreaddata
1780 RESTORE +0:REM cube
1790 REPEAT
1800 PT%+=1
1810 READ x%(PT%),y%(PT%),z%(PT%)
1820 UNTIL x%(PT%)=999 OR PT%=pnts%-1
1830 PT%-=1
1840 ENDPROC
1850 :
1860 DATA 20,-20,-20, 20,20,-20, 20,20,20, 20,-20,20
1870 DATA -20,-20,-20, -20,20,-20, -20,20,20, -20,-20,20
1880 DATA 999,999,999
```

Listing 3

```
10 REM >ARMSort (RR3)
20 REM A fast sort routine
30 REM by Dave Acton
40 REM for Achimedes only
50 REM (c) BAU May 1990
60 :
70 MODE 0
80 DIM code% &400
90 PROCass
100 INPUT"How many objects? "objects%
110 IF objects%<=0 objects%=2000
120 PRINT"Building random table..."
130 seed%=RND(-&DCA)
140 DIM d% 4*objects%
150 FOR i%=0 TO objects%-1
160 d%!(4*i%)=RND(100000)
170 NEXT
180 CLS
190 PRINT"Objects to sort: ";objects%'
200 PRINT'"Before:"
210 PROCshow(objects%/10)
220 TIME=0
230 PROCquicksort(d%,objects%)
240 t%=TIME
250 PRINT'"After:"
260 PROCshow(objects%/10)
270 PRINT'"Time taken: ";t%/100
280 END
290 :
300 DEF PROCshow(step%)
310 LOCAL i%
320 IF step%<1 step%=1
330 FOR i%=0 TO objects%-1 STEP step%
340 PRINTi%,d%!(4*i%)
350 NEXT
360 ENDPROC
370 :
380 DEF PROCquicksort(A%,B%)
390 CALL qsort
400 ENDPROC
410 :
420 DEF PROCass
430 qsa=0:qsn=1
440 qsi=2:qsj=3
450 qsp=4
460 qstemp1=5
470 qstemp2=6
480 sp=13:link=14:pc=15
490 FOR pass%=0 TO 2 STEP 2
500 P%=code%
510 [OPT pass%
520 .qsort
530 STMFD (sp)!,{link}
540 MOV qsi,#0
550 LDR qstemp1,[qsa]
560 .findpivot
570 LDR qstemp2,[qsa,qsi,ASL #2]
580 CMP qstemp1,qstemp2
590 BNE gotpiv
600 ADD qsi,qsi,#1
610 CMP qsi,qsn
620 BNE findpivot
630 LDMFD (sp)!,{pc}
640 .gotpiv
650 MOVGT qsp,qstemp1
660 MOVLE qsp,qstemp2
670 MOV qsi,#0
680 SUB qsj,qsn,#1
690 CMP qsi,qsj
700 BGT parted
710 .partloop
720 .part1a
730 LDR qstemp1,[qsa,qsi,ASL #2]
740 CMP qstemp1,qsp
750 ADDLT qsi,qsi,#1
760 BLT part1a
770 .part1b
780 LDR qstemp2,[qsa,qsj,ASL #2]
790 CMP qstemp2,qsp
800 SUBGE qsj,qsj,#1
810 BGE part1b
820 CMP qsi,qsj
830 BGE noswap
840 STR qstemp1,[qsa,qsj,ASL #2]
850 STR qstemp2,[qsa,qsi,ASL #2]
860 ADD qsi,qsi,#1
870 SUB qsj,qsj,#1
880 .noswap
890 CMP qsi,qsj
900 BLE partloop
910 .parted
920 STMFD (sp)!,{qsa,qsi,qsn}
930 MOV qsn,qsi
940 BL qsort
950 LDMFD (sp),{qsa,qsi,qsn}
960 ADD qsa,qsa,qsi,ASL #2
970 SUB qsn,qsn,qsi
980 BL qsort
990 LDMFD (sp)!,{qsa,qsi,qsn,pc}
1000 ]
1010 NEXT pass%
1020 ENDPROC
```

Listing 4

```
10 REM >Planets (RR4)
20 REM by Barry Wickett
30 REM for Archimedes only
40 REM (c) BAU May 1990
50 :
60 DIM radius(10),time(10),angle(10),name$(10)
70 MODE 8
80 screenbank=1
90 orbit=TRUE
100 xscale=0.2
110 yscale=0.1
120 ORIGIN 640,512
130 MOUSE RECTANGLE 30,30,300,300
140 :
150 FOR planet=1 TO 9
160 READ name$(planet),radius(planet),time(planet)
170 radius(planet)=SQR(radius(planet))
180 NEXT planet
190 :
200 FOR planet=1 TO 9
210 angle(planet)=((PI*2)/(time(planet)))*86400
220 NEXT planet
230 :
240 days=0
250 REPEAT
260 MOUSE mx,my,mz
270 GCOL 0,0
280 RECTANGLE FILL -640,-512,1280,1023
290 PRINT TAB(0,0);"Days ";days
300 GCOL 0,2
310 CIRCLE FILL 0,0,25
320 IF orbit=TRUE AND mz=0 THEN
330 GCOL 0,1
340 FOR planet=1 TO 9
350 ELLIPSE 0,0,(radius(planet)/11E+2)*xscale*(mx/100),(radius(planet)/11E+2)*yscale*(my/100)
360 NEXT planet
370 ENDIF
380 GCOL 0,3
390 FOR planet=1 TO 9
400 X=(COS(angle(planet)*days)*radius(planet)/11E+2)*xscale*(mx/100)
410 Y=(SIN(angle(planet)*days)*radius(planet)/11E+2)*yscale*(my/100)
420 CIRCLE FILL X,Y,10
430 MOVE X+16,Y
440 VDU 5
450 PRINT name$(planet)
460 VDU 4
470 NEXT planet
490 WAIT
500 SYS "OS_Byte",112,screenbank
510 screenbank=3-screenbank
520 SYS "OS_Byte",113,screenbank
530 days+=1
540 UNTIL FALSE
550 :
560 DATA Mercury,5.79E+10,7.6E+6
570 DATA Venus,1.08E+11,1.94E7
580 DATA Earth,1.49E+11,3.16E+7
590 DATA Mars,2.28E+11,5.94E+7
600 DATA Jupiter,7.78E+11,3.74E+8
610 DATA Saturn,1.43E+12,9.3E+8
620 DATA Uranus,2.87E+12,2.66E+9
630 DATA Neptune,4.50E+12,5.20E+9
640 DATA Pluto,5.9E+12,7.82E+9
```

Listing 5

```
10 REM >FKeys (RR5)
20 REM by Dave Acton
30 REM for Archimedes only
40 REM (c) BAU May 1990
50 :
60 PROCinitkeys
70 PRINT"Press keys to see codes produced..."
80 REPEAT
90 key=FNinkey(10)
100 IF key>=0 PRINT"&";RIGHT$("00"+STR$~key,3)
110 UNTIL key=27
120 PROCreset
130 END
140 :
150 DEF PROCinitkeys
160 FOR osb%=221 TO 228
170 SYS "OS_Byte",osb%,2
180 NEXT
190 *FX 4,2
200 *FX 229,1
210 ENDPROC
220 :
230 DEF PROCreset
240 FOR osb%=221 TO 228
250 SYS "OS_Byte",osb%,0
260 NEXT
270 *FX 4
280 *FX 229
290 PRINT REPORT$" at line ";ERL
300 ENDPROC
310 :
320 DEF FNinkey(delay)
330 LOCAL k,k2
340 k=INKEY(delay)
350 IF k<>0 THEN =k
360 k2=INKEY(0)
370 IF k2<=0 THEN =k2
380 =&100+k2
```

RISC REVUE

Listing 6

```
10 REM >FileTypes (RR6)
20 REM OS Variable Demo
30 REM by Dave Acton
40 REM for Archimedes only
50 REM (c) BAU May 1990
60 :
70 DIM useful% &100
80 PRINT"Named filetypes:"'
90 SYS "OS_ReadVarVal","File$Type_###
",useful%,&100,0,3 TO ,,l%,p%
100 WHILE l%>0
110 useful%?l%=13
120 PRINT$useful%,;
130 SYS "XOS_ReadVarVal","File$Type_##
#",useful%,&100,p%,3 TO ,,l%,p%
140 ENDWHILE
150 PRINT
160 END
```

EIGHT BITS

Listing 1

```
10 REM Demon Cyclic Space
20 REM by Phil Bender
30 REM for B/B+/M/C/E
40 REM (c) BAU May 199Ø
50 :
60 *TVØ,1
70 MODE2
80 HIMEM=&2DØØ
90 VDU23;82Ø2;Ø;Ø;Ø;
100 PROCass
110 PROCsetup
120 PRINT''"Press:-"''"  P to pause"''
"  O to resume"''"  Q to quit"
130 REPEAT
140 INPUT''"Max value (1-15) "M%
150 M%=M%AND15
160 ?&77=M%
170 !rand=-TIME
180 CALL init
190 REPEAT CALL prog
200 IF INKEY-56 REPEAT UNTIL INKEY-55
210 UNTIL INKEY-17
220 CLS
230 PRINTTAB(4,1Ø)"Again? (Y/N)"
240 REPEAT Q%=GET AND &DF
250 UNTIL Q%=78 OR Q%=89
260 UNTIL Q%=78
270 END
280 DEFPROCsetup
290 FORJ%=ØTO15
300 READ byte%,screen%
310 bytab%?screen%=byte%
320 scrtab%?byte%=screen%
330 NEXT
340 DATAØ,Ø,1,1,2,4,3,5,4,16,5,17,6,2Ø
,7,21
350 DATA8,64,9,65,1Ø,68,11,69,12,8Ø,13
,81,14,84,15,85
360 FOR J%=Ø TO 15
370 READ C%
380 VDU19,J%,C%;Ø;
390 NEXT
400 DATA Ø,6,2,3,1,5,4,7,Ø,6,2,3,1,5,4
,7
410 ENDPROC
420 DEFPROCass
430 inbuff=&2D8Ø
440 lbuff=&2EØØ
450 mbuff=&2E8Ø
460 rbuff=&2FØØ
470 outbuff=&2F8Ø
480 bytab%=&2DØØ
490 scrtab%=&2D6Ø
500 coltop=&7Ø
510 aplus=&72
520 tempx=&73
530 tempy=&74
540 column=&75
550 aplus=&76
560 max=&77
570 tempa=&78
580 rand=&8Ø
590 FOR opt=Ø TO 2 STEP 2
600 P%=&9ØØ
610 [OPT opt
620 SEI
630 .prog
640 LDA#Ø
650 TAX    \zerobuffs
660 .loopH
670 STA &2EØØ,X
680 STA &2FØØ,X
690 INX
700 BNE loopH
710 LDX #79
720 JSR readcol
730 JSR rpix
740 JSR movebuffs
750 LDX #Ø
760 STX column
770 JSR readcol
780 JSR lpix
790 .mainloop
800 JSR movebuffs
810 JSR rpix
820 LDA #Ø
830 TAY
840 .loopJ
850 STA outbuff,Y
860 INY
870 BPL loopJ
880 JSR new
890 LDX #Ø
900 .loopK
910 ASL outbuff,X
920 INX
930 BPL loopK
940 JSR movebuffs
950 LDX column
960 INX
970 CPX #8Ø
980 BNE notlast
990 LDX #Ø
1000 .notlast
1010 JSR readcol
1020 JSR lpix
1030 JSR new
1040 LDX column
1050 JSR writecol
1060 INX
1070 STX column
1080 CPX #8Ø
1090 BNE mainloop
1100 CLI
1110 RTS
1120  \ subs
1130 .getcoltop
1140 STX coltop
1150 LDA #Ø
1160 ASL coltop
1170 ROL A
1180 ASL coltop
1190 ROL A
1200 ASL coltop
1210 ROL A
1220 ADC #&3Ø
1230 STA coltop+1
1240 RTS
1250 :
1260 .readcol
1270 STX tempx
1280 JSR getcoltop
1290 LDX #Ø
1300 .loopA
1310 LDY #Ø
1320 .loopB
1330 LDA (coltop),Y
1340 STA inbuff,X
1350 INX
1360 INY
1370 INY
1380 CPY #8
1390 BNE loopB
1400 LDA coltop
1410 CLC
1420 ADC #&8Ø
1430 STA coltop
1440 LDA coltop+1
1450 ADC #2
1460 STA coltop+1
1470 BPL loopA
1480 LDX tempx
1490 RTS
1500 :
1510 .writecol
1520 STX tempx
1530 JSR getcoltop
1540 LDX #Ø
1550 .loopC
1560 LDY #Ø
1570 .loopD
1580 LDA outbuff,X
1590 STA (coltop),Y
1600 INY
1610 STA (coltop),Y
1620 INY
1630 INX
1640 CPY #8
1650 BNE loopD
1660 LDA coltop
1670 CLC
1680 ADC #&8Ø
1690 STA coltop
1700 LDA coltop+1
1710 ADC #2
1720 STA coltop+1
1730 BPL loopC
1740 LDX tempx
1750 RTS
1760 :
1770 .lpix
1780 STX tempx
1790 LDY #127
1800 .loopE
1810 LDA inbuff,Y
1820 AND #&AA
1830 LSR A
1840 TAX
1850 LDA bytab%,X
1860 STA rbuff,Y
1870 DEY
1880 BPL loopE
1890 LDX tempx
1900 RTS
1910 :
1920 .rpix
1930 STX tempx
1940 LDY #127
1950 .loopF
1960 LDA inbuff,Y
1970 AND #&55
1980 TAX
1990 LDA bytab%,X
2000 STA rbuff,Y
2010 DEY
2020 BPL loopF
2030 LDX tempx
2040 RTS
2050 :
2060 .movebuffs
2070 LDY #Ø
2080 .loopG
2090 LDA mbuff,Y
2100 STA lbuff,Y
2110 LDA rbuff,Y
2120 STA mbuff,Y
2130 INY
2140 BPL loopG
2150 RTS
2160 :
2170 .new
2180 LDY #Ø
2190 .loopN
2200 STY tempy
2210 LDA mbuff,Y
2220 STA tempa
2230 STA aplus
2240 INC aplus
2250 CMP max
2260 BCC chkl
2270 LDA #Ø
2280 STA aplus
2290 .chkl
2300 LDX lbuff,Y
2310 CPX aplus
2320 BNE chkr
2330 LDA scrtab%,X
2340 ORA outbuff,Y
2350 STA outbuff,Y
2360 JMP nexty
2370 .chkr
2380 LDX rbuff,Y
2390 CPX aplus
2400 BNE chku
2410 LDA scrtab%,X
2420 ORA outbuff,Y
2430 STA outbuff,Y
2440 JMP nexty
2450 .chku
2460 DEY
2470 BPL norap1
2480 LDY #127
2490 .norap1
2500 LDX mbuff,Y
2510 CPX aplus
2520 BNE chkd
2530 LDA scrtab%,X
2540 LDY tempy
2550 ORA outbuff,Y
2560 STA outbuff,Y
2570 JMP nexty
2580 .chkd
2590 LDY tempy
2600 INY
2610 BPL norap2
2620 LDY #Ø
2630 .norap2
2640 LDX mbuff,Y
2650 CPX aplus
2660 BEQ yes
2670 LDX tempa
2680 .yes
2690 LDA scrtab%,X
2700 LDY tempy
2710 ORA outbuff,Y
2720 STA outbuff,Y
2730 .nexty
2740 INY
2750 BMI done
2760 JMP loopN
2770 .done
2780 RTS
2790 :
2800 .init
2810 LDA max
2820 STA aplus
2830 INC aplus
2840 LDA #Ø
2850 STA column
2860 .loopR
2870 LDY#Ø
2880 .loopS
2890 JSR random
2900 LDA scrtab%,X
2910 ASL A
2920 STA outbuff,Y
2930 JSR random
2940 LDA scrtab%,X
2950 ORA outbuff,Y
2960 STA outbuff,Y
2970 INY
2980 BPL loopS
2990 LDX column
3000 JSR writecol
3010 INX
3020 STX column
3030 CPX #8Ø
3040 BNE loopR
3050 RTS
3060 :
3070 .random
3080 LDA rand
3090 AND #&48
3100 ADC #&38
3110 ASL A
3120 ASL A
3130 ROL rand+2
3140 ROL rand+1
3150 ROL rand
3160 LDA rand
3170 AND #15
3180 CMP aplus
3190 BCS random
3200 TAX
3210 RTS
3220 ]
3230 NEXT
3240 ENDPROC
```

Listing 2

```
10 REM Viewsheet graph program
20 REM by Andy Pillidge
30 REM for B/B+/E/M/C
40 REM (c) BAU May 9Ø
50 :
60 MODEØ
70 @%=&ØØ8ØØ
80 VDU23,224,&EØ,&AØ,&EØ,Ø,Ø,Ø,Ø,Ø
90 REPEAT
100 CLS
110 PRINTTAB(12,3)"GRAPH PLOTTING FROM
VIEWSHEET LINKING FILE"
120 PRINT'
130 *CAT V
140 PRINT'
150 INPUT TAB(12)"Linking file number?
VS"L%
160 UNTIL L%>Ø AND L%<256
170
180 file$="V.VS"+STR$(L%)
190 PROCdimension(file$)
200 CLS
210 PRINTTAB(15,6)file$
220 PRINTTAB(15,1Ø)"File size:  ";xm;"
by ";ym
230 PRINTTAB(15,12)"Max value = ";max
240 PRINTTAB(15,14)"Min value = ";min
250
260 seg=1Ø^(INT(LOG(ABS((max-min)/2.5)
)))
270 gmax=(INT(max/seg)+1)*seg
280 gmin=(INT(min/seg))*seg
290
300 PRINTTAB(15,18)"Default graph mini
mum = ";gmin;" step size ";seg
310 REPEAT
320 INPUTTAB(15,2Ø)"Preferred graph mi
nimum "m$
330 IF m$="" THEN m=gmin ELSE m=VAL(m$
)
340 UNTIL m/seg=INT(m/seg) AND m<=gmin
350 gmin=m
360
370 PRINTTAB(15,23)"Default graph maxi
mum = ";gmax
380 REPEAT
```

Continued ▶

RISC REVUE

◀ Continued

```
 390 INPUTTAB(15,25)"Preferred graph maximum "m$
 400 IF m$="" THEN m=gmax ELSE m=VAL(m$)
 410 UNTIL m/seg=INT(m/seg) AND m>=gmax
 420 gmax=m
 430
 440 VDU5
 450 VDU29,12Ø;92Ø;
 460 PROCaxes
 470 VDU4:PRINTTAB(1Ø,1)"Title?":INPUTTAB(1Ø,2)""T$:PRINTTAB(1Ø,1)"       "
 480 VDU5
 490 C%=OPENIN(file$)
 500
 510 FOR y=1 TO ym
 520 MOVE FNx(1),FNy(FNread(1,y))
 530 FOR x=1 TO xm
 540 val=FNread(x,y)
 550 IF val<>Ø THEN DRAW FNx(x),FNy(val):PLOT Ø,-2,4:VDU224:MOVE FNx(x),FNy(val)
 560 NEXT
 570 NEXT
 580
 590 CLOSE#C%
 600 VDU4
 610 PRINT TAB(Ø,3Ø)
 620 END
 630 :
 640 DEF PROCdimension(file$)
 650 C%=OPENIN(file$)
 660 PTR#C%=3
 670 ym=BGET #C%
 680 xm=BGET #C%
 690 PTR #C%=6
 700 min=1E38:max=-1E38
 710 FOR J%=1 TO xm*ym
 720 INPUT#C%,data
 730 IF data<min AND data<>Ø THEN min=data
 740 IF data>max THEN max=data
 750 NEXT
 760 CLOSE#C%
 770 ENDPROC
 780 :
 790 DEF FNread(x,y)
 800 PTR #C%=((y-1)*xm+x-1)*6+6
 810 INPUT #C%,data
 820 =data
 830
 840 DEFPROCaxes
 850 CLS
 860 MOVEØ,Ø:DRAWØ,-8ØØ:DRAW12ØØ,-8ØØ
 870 FOR N%=1 TO xm
 880 MOVE FNx(N%),FNy(gmin)
 890 DRAW FNx(N%),FNy(gmin)-1Ø
 900 MOVE FNx(N%)-8,FNy(gmin)-2Ø
 910 PRINT MID$("JFMAMJJASOND",(N%-1)MOD12+1,1)
 920 NEXT N%
 930 FOR y=gmin TO gmax STEP seg
 940 MOVE Ø,FNy(y)
 950 DRAW -8,FNy(y)
 960 MOVE -12Ø,FNy(y)+16
 970 PRINT y
 980 NEXT y
 990 ENDPROC
1000
1010 DEF FNx(x)=x*1Ø2Ø/xm
1020 DEF FNy(y)=(y-gmin)/(gmax-gmin)*8ØØ-8ØØ
```

Listing 3

```
  1Ø REM Create hard disc partition
  2Ø REM by Henk Oostrom
  3Ø REM for B/B+/M with hard disc & Master 512
  4Ø REM (c) BAU May 9Ø
  5Ø :
  6Ø MODE 3
  7Ø *MOUNT Ø
  8Ø *MAP
  9Ø IF VPOS<=2 GOTO 14Ø
 1ØØ PROCtitle
 11Ø PRINTTAB(Ø,6)"The free space on your hard disk is fragmented!"
 12Ø PRINT'"You have to compact your hard disk first."
 13Ø END
 14Ø PROCtitle
 15Ø ON ERROR IF ERR=196 GOTO 18Ø
 16Ø *CDIR DOS
 17Ø GOTO 25Ø
 18Ø PRINT''"A DOS+ partition already exists. Continue (YES/NO) ? ";
 19Ø INPUT""A$
 2ØØ IF A$="YES" OR A$="yes" GOTO 21Ø ELSE END
 21Ø *DIR $.DOS
 22Ø ON ERROR IF ERR=214 GOTO 26Ø
 23Ø *DELETE DRIVE_C
 24Ø GOTO 26Ø
 25Ø *DIR $.DOS
 26Ø ON ERROR PRINT''"Error ";ERR;" in line ";ERL:END
 27Ø Y%=OPENOUT"LEN_DRV_C"
 28Ø PRINT #Y%,H%
 29Ø CLOSE#Y%
 3ØØ DIM Naam 1Ø,Blok 3Ø
 31Ø A%=&71
 32Ø X%=Blok MOD 256
 33Ø Y%=Blok DIV 256
 34Ø CALL &FFF1
 35Ø F%=!Blok
 36Ø G%=F% DIV 1Ø24
 37Ø G%=G% DIV 1Ø24
 38Ø PRINT''"There are ";G%;" MBytes free on your hard disk."
 39Ø IF G%<5 PRINT''"This is not enough for a DOS+ partition!":END
 4ØØ PRINT''"Enter size DOS+ partition (in MBytes): ";
 41Ø INPUT""H%
 42Ø IF H%<5 OR H%>G% PRINT"Size must be between 5 and ";G%;" MBytes!":PRINTTAB(15,24)"<PRESS A KEY TO CONTINUE>";:H%=GET:PROCtitle:GOTO 4ØØ
 43Ø Y%=OPENUP"LEN_DRV_C"
 44Ø PRINT #Y%,H%
 45Ø CLOSE#Y%
 46Ø L%=(H%*512-2)*2Ø48+(H%+17)*1Ø24
 47Ø R%=F%-L%
 48Ø PROCtitle
 49Ø PRINT''"Creating file DRIVE_C . . ."
 5ØØ $Naam="DUMMY"
 51Ø A%=7
 52Ø X%=Blok MOD 256
 53Ø Y%=Blok DIV 256
 54Ø ?Blok=Naam MOD 256
 55Ø Blok?1=Naam DIV 256
 56Ø Blok!2=Ø
 57Ø Blok!6=&FFFFFFFF
 58Ø Blok!1Ø=Ø
 59Ø Blok!14=R%
 6ØØ CALL&FFDD
 61Ø $Naam="DRIVE_C"
 62Ø ?Blok=Naam MOD 256
 63Ø Blok?1=Naam DIV 256
 64Ø Blok!2=Ø
 65Ø Blok!6=&FFFFFFFF
 66Ø Blok!1Ø=Ø
 67Ø Blok!14=L%
 68Ø CALL&FFDD
 69Ø ON ERROR OFF
 7ØØ *DELETE DUMMY
 71Ø PRINT''"Writing file header . . ."
 72Ø Y%=OPENUP "DRIVE_C"
 73Ø PTR#Y%=Ø
 74Ø FOR I%=1 TO 19
 75Ø READ B%
 76Ø BPUT#Y%,B%
 77Ø NEXT
 78Ø BPUT#Y%,(L% DIV 1Ø24) MOD 256
 79Ø BPUT#Y%,(L% DIV 1Ø24) DIV 256
 8ØØ BPUT#Y%,&F9
 81Ø BPUT#Y%,H%
 82Ø PRINT''"Clearing  FAT and root directory . . ."
 83Ø PRINT;H%+17;" blocks (1 k each) must be written."
 84Ø PRINTSTRING$(H%+17,"#");:VDU13
 85Ø REPEAT
 86Ø BPUT#Y%,&ØØ
 87Ø IF PTR#Y% MOD 1Ø24 = Ø PRINT" ";
 88Ø UNTIL PTR#Y%>(H%*1Ø24+&44ØØ)
 89Ø PRINT''"Initialising FAT and root directory . . ."
 9ØØ PTR#Y%=&4ØØ
 91Ø BPUT#Y%,&F9
 92Ø BPUT#Y%,&FF
 93Ø BPUT#Y%,&FF
 94Ø IF H%>7 BPUT#Y%,&FF
 95Ø PTR#Y%=&4ØØ+H%*1Ø24
 96Ø FOR I%=1 TO 32
 97Ø READ B%
 98Ø BPUT#Y%,B%
 99Ø NEXT I%
1ØØØ CLOSE #Y%
1Ø1Ø PRINT''"At last, ready!"
1Ø2Ø DEF PROCtitle
1Ø3Ø CLS
1Ø4Ø PRINT STRING$(68,"=")
1Ø5Ø PRINT TAB(11)"HARD DISK PARTITION PROGRAM         version 1.4"
1Ø6Ø PRINT TAB(11)"(C) HENK OOSTROM, ZOETERMEER NETHERLANDS, 1989"
1Ø7Ø PRINT STRING$(68,"=")
1Ø8Ø ENDPROC
1Ø9Ø REM data file header
11ØØ DATA &EB,&FE,&9Ø,&41,&63,&6F,&72,&6E
111Ø DATA &2Ø,&2Ø,&2Ø,&Ø,&4,&2,&1,&Ø,&1,&Ø,&2
112Ø REM data directory header
113Ø DATA &4D,&61,&73,&74,&65,&72,&2Ø,&2Ø
114Ø DATA &35,&31,&32,&Ø8,&ØØ,&ØØ,&ØØ,&ØØ
115Ø DATA &ØØ,&ØØ,&ØØ,&ØØ,&ØØ,&ØØ,&ØØ,&ØØ
116Ø DATA &21,&ØØ,&ØØ,&ØØ,&ØØ,&ØØ,&ØØ,&ØØ
```

Listing 4

```
  1Ø REM Recover hard disc
  2Ø REM by Henk Oostrom
  3Ø REM for B/B+/M with hard disc
  4Ø REM (c) BAU May 9Ø
  5Ø :
  6Ø MODE 3
  7Ø *MOUNT Ø
  8Ø *MAP
  9Ø IF VPOS>2 THEN PROCtitle:PRINTTAB(Ø,6)"The free space on your hard disk is fragmented!":PRINT'"You have to compact your hard disk first.":END
 1ØØ PROCtitle
 11Ø *DIR $.DOS
 12Ø ON ERROR PRINT''"Error ";ERR;" in line ";ERL:END
 13Ø DIM Naam 1Ø:DIM Blok 3Ø
 14Ø A%=&71:X%=Blok MOD 256:Y%=Blok DIV 256
 15Ø CALL &FFF1
 16Ø F%=!Blok:G%=F% DIV 1Ø24:G%=G% DIV 1Ø24
 17Ø Y%=OPENIN"LEN_DRV_C":INPUT #Y%,H%:CLOSE#Y%
 18Ø L%=(H%*512-4)*2Ø48+(H%+17)*1Ø24
 19Ø R%=F%-L%
 2ØØ PROCtitle
 21Ø PRINT''"Restoring file DRIVE_C . . ."
 22Ø $Naam="DUMMY"
 23Ø A%=7:X%=Blok MOD 256:Y%=Blok DIV 256
 24Ø ?Blok=Naam MOD 256
 25Ø Blok?1=Naam DIV 256
 26Ø Blok!2=Ø
 27Ø Blok!6=&FFFFFFFF
 28Ø Blok!1Ø=Ø
 29Ø Blok!14=R%
 3ØØ CALL&FFDD
 31Ø $Naam="DRIVE_C"
 32Ø ?Blok=Naam MOD 256
 33Ø Blok?1=Naam DIV 256
 34Ø Blok!2=Ø
 35Ø Blok!6=&FFFFFFFF
 36Ø Blok!1Ø=Ø
 37Ø Blok!14=L%
 38Ø CALL&FFDD
 39Ø ON ERROR OFF
 4ØØ *DELETE DUMMY
 41Ø END
 42Ø DEF PROCtitle
 43Ø CLS
 44Ø PRINT STRING$(68,"=")
 45Ø PRINTTAB(6)"DOS+ HARD DISK PARTITION REPAIR PROGRAM   version 1.1"
 46Ø PRINTTAB(6)"(C) HENK OOSTROM,   ZOETERMEER   NETHERLANDS,    1989"
 47Ø PRINT STRING$(68,"=")
 48Ø ENDPROC
```

NEW MODES

Listing 1

```
  1Ø REM >NM1
  2Ø REM OS_ReadModeVariable
  3Ø REM by David Acton
  4Ø REM for Archimedes only
  5Ø REM (c) BAU May 199Ø
  6Ø :
  7Ø MODE 12
  8Ø REPEAT
  9Ø COLOUR 6
 1ØØ INPUT"Enter a screen mode number: "mode%
 11Ø COLOUR 7
 12Ø PRINT''"Mode ";mode%
 13Ø SYS "OS_CheckModeValid",mode% TO ,realmode%;ok%
 14Ø IF (ok% AND 2)>Ø THEN
 15Ø IF realmode%<>mode% PRINT'"(Mode is invalid - mode ";realmode%;" will be used instead)"
 16Ø ENDIF
 17Ø modetype%=FNreadmodevar(Ø)
 18Ø PRINT
 19Ø IF (modetype% AND 1)=Ø PRINT"Graphics mode" ELSE PRINT"Non-graphics mode"
 2ØØ IF (modetype% AND 2)>Ø PRINT"Teletext mode"
 21Ø IF (modetype% AND 4)>Ø PRINT"Gap mode" ELSE PRINT"Non-gap mode"
 22Ø maxcol%=FNreadmodevar(3)
 23Ø IF maxcol%=63 maxcol%=255
 24Ø PRINT'"Colours available: ";maxcol%+1
 25Ø PRINT''
 26Ø UNTIL FALSE
 27Ø END
 28Ø :
 29Ø DEF FNreadmodevar(n%)
 3ØØ LOCAL v%
 31Ø SYS "OS_ReadModeVariable",mode%,n% TO ,,v%
 32Ø =v%
```

Listing 2

```
  1Ø REM >NM2
  2Ø REM OS_ReadVduVariables
  3Ø REM by David Acton
  4Ø REM for Archimedes only
  5Ø REM (c) BAU May 199Ø
  6Ø :
  7Ø MODE 15
  8Ø DIM t% &1ØØ
  9Ø PRINT"Current mode is ";MODE
 1ØØ !t%=128
 11Ø t%!4=129
 12Ø t%!8=13Ø
 13Ø t%!12=131
 14Ø t%!16=148
 15Ø t%!2Ø=7
 16Ø t%!24=-1
 17Ø SYS "OS_ReadVduVariables",t%,t%
 18Ø PRINT"Graphics window is ";!t%;",";t%!4;",";t%!8;",";t%!12;
 19Ø PRINT" (Internal co-ordinates)"
 2ØØ PRINT"Screen start address is at &";~t%!16
 21Ø PRINT"One screen takes up ";t%!2Ø;" bytes (";(t%!2Ø) DIV 1Ø24;"K)"
 22Ø END
```

Listing 3

```
  1Ø REM >NM3
  2Ø REM Testcard
  3Ø REM by David Acton
  4Ø REM for Archimedes only
  5Ø REM (c) BAU May 199Ø
  6Ø :
  7Ø DIM vars% &1Ø
  8Ø SYS "OS_SWINumberFromString",,"OS_CheckModeValid" TO swicmv%
  9Ø REPEAT
 1ØØ MODE Ø
 11Ø PRINT"Modes available: "'
 12Ø FOR i%=Ø TO 255
 13Ø SYS swicmv%,i% TO ;ok%
 14Ø IF (ok% AND 2)=Ø PRINT i%,;
 15Ø NEXT
 16Ø PRINT''
 17Ø REPEAT
 18Ø INPUT"Which mode? "mode%
 19Ø SYS swicmv%,mode% TO ;ok%
 2ØØ UNTIL (ok% AND 2)=Ø
 21Ø MODE mode%
 22Ø OFF
 23Ø modeflags%=FNmodevar(Ø)
 24Ø columns%=FNmodevar(1)+1
 25Ø rows%=FNmodevar(2)+1
 26Ø cols%=FNmodevar(3)+1
 27Ø IF cols%=64 colours%=256 ELSE colours%=cols%
 28Ø xpix%=FNmodevar(11)+1
 29Ø ypix%=FNmodevar(12)+1
 3ØØ xeig%=FNmodevar(4)
 31Ø yeig%=FNmodevar(5)
 32Ø xcharsize%=FNmodevar(162)<<xeig%
 33Ø ycharsize%=FNmodevar(163)<<yeig%
```

Continued ▶

NEW MODES

◀ Continued

```
340 xcharspace%=FNmodevar(164)<<xeig%
350 ycharspace%=FNmodevar(165)<<yeig%
360 maxxpix%=xpix%<<xeig%
370 maxypix%=ypix%<<yeig%
380 :
390 IF (modeflags% AND 1)=1 THEN
400 r%=rows%/2
410 PROCcentre("Mode "+STR$(MODE),r%-2)
420 PROCcentre("Non-graphics",r%+2)
430 ELSE
440 csize%=42
450 xcent%=maxxpix%/2
460 ycent%=maxypix%/2
470 xsqs%=(xcent% DIV csize%)+2
480 ysqs%=(ycent% DIV csize%)+2
490 c%=Ø
500 FOR x%=-xsqs% TO xsqs%
510 FOR y%=-ysqs% TO ysqs%
520 ox%=xcent%+x%*csize%
530 oy%=ycent%+y%*csize%
540 GCOL c%
550 c%=(c%+1) MOD cols%
560 CIRCLE FILL ox%,oy%,csize%*2/3
570 GCOL Ø
580 CIRCLE ox%,oy%,csize%*2/3
590 NEXT
600 NEXT
610 PROCbox(Ø,"Mode "+STR$(MODE),"")
620 PROCbox(1,"Pixels:",STR$(xpix%)+" x "+STR$(ypix%))
630 PROCbox(2,"Text:",STR$(columns%)+" x "+STR$(rows%))
640 PROCbox(3,"Colours:",STR$(colours%))
650 ENDIF
660 wait=GET
670 UNTIL FALSE
680 END
690 :
700 DEF PROCcentre(t$,y%)
710 PRINTTAB((columns%-LEN(t$))/2,y%)t$
720 ENDPROC
730 :
740 DEF PROCbox(n%,t1$,t2$)
750 boxheight%=maxypix%/8
760 boxwidth%=maxxpix%*Ø.7
770 boxox%=xcent%-boxwidth%/2
780 boxoy%=maxypix%-(n%+1)*(maxypix%/4)+maxypix%/16
790 GCOL Ø
800 RECTANGLE FILL boxox%,boxoy%,boxwidth%,boxheight%
810 CASE colours% OF
820 WHEN 2:GCOL 1
830 WHEN 4:GCOL 3
840 WHEN 16:GCOL 7
850 WHEN 256:GCOL 63 TINT 192
860 ENDCASE
870 RECTANGLE boxox%,boxoy%,boxwidth%,boxheight%
880 VDU 5
890 IF t2$="" THEN
900 x%=boxox%+boxwidth%/2-(LEN(t1$)*xcharsize%)/2
910 y%=boxoy%+boxheight%/2
920 MOVE x%,y%+ycharsize%/2-1
930 PRINTt1$
940 ELSE
950 x%=boxox%+boxwidth%/2-(LEN(t1$)*xcharsize%)/2
960 y%=boxoy%+boxheight%/2
970 MOVE x%,y%+ycharsize%*1.25-1
980 PRINTt1$
990 x%=boxox%+boxwidth%/2-(LEN(t2$)*xcharsize%)/2
1000 MOVE x%,y%-ycharsize%*Ø.25-1
1010 PRINTt2$
1020 ENDIF
1030 VDU 4
1040 OFF
1050 ENDPROC
1060 :
1070 DEF FNmodevar(n%)
1080 !vars%=n%
1090 vars%!4=-1
1100 SYS "OS_ReadVduVariables",vars%,vars%
1110 =!vars%
```

Listing 4

```
10 REM >NM4
20 REM Mode creator
30 REM by David Acton
40 REM for Archimedes only
50 REM (c) BAU May 199Ø
60 :
70 MODE Ø
80 DIM code% &1ØØØ
90 REPEAT
100 INPUT"Colours (2,4,16 or 256): "colours%
110 CASE colours% OF
120 WHEN 2:basemode%=Ø:pixelsperbyte%=8:k%=19
130 WHEN 4:basemode%=8:pixelsperbyte%=4:k%=11
140 WHEN 16:basemode%=12:pixelsperbyte%=2:k%=7
150 WHEN 256:basemode%=15:pixelsperbyte%=1:k%=5
160 OTHERWISE
170 basemode%=-1
180 ENDCASE
190 UNTIL basemode%<>-1
200 REPEAT
210 INPUT"Columns (8-1ØØ): "maxcol%
220 UNTIL maxcol%>=8 AND maxcol%<=1ØØ
230 REM Round number of columns up to a multiple of 4...
240 maxcol%=((maxcol%+3) AND (NOT 3))
250 hpix%=8*maxcol%
260 REPEAT
270 INPUT"Rows (8-4Ø): "maxrow%
280 UNTIL maxrow%>=8 AND maxrow%<=4Ø
290 REPEAT
300 PROCins("123")
310 INPUT"Number of new mode (3Ø-127): "newmode%
320 UNTIL newmode%>=3Ø AND newmode%<=127
330 vpix%=8*maxrow%
340 :
350 hcycle%=1Ø24
360 vcycle%=32Ø
370 hsyncwidth%=58
380 vsyncwidth%=Ø
390 remainh%=hcycle%-hpix%
400 hbordstart%=64+remainh%/4
410 hdispstart%=hbordstart%+remainh%/4
420 hdispend%=hdispstart%+hpix%
430 hbordend%=hdispend%+remainh%/4
440 remainv%=vcycle%-vpix%
450 vbordstart%=1Ø+remainv%/4
460 vdispstart%=vbordstart%+remainv%/4
470 vdispend%=vdispstart%+vpix%
480 vbordend%=vdispend%+remainv%/4
490 screensize%=((vpix%*hpix%) DIV pixelsperbyte%+&FFF) AND &FFFFFØØØ
500 IF colours%=256 colours%=64
510 :
520 title$="BAUModes"
530 link=14:pc=15
540 FOR pass%=4 TO 6 STEP 2
550 P%=Ø
560 O%=code%
570 [OPT pass%
580 .module
590 EQUD Ø
600 EQUD Ø
610 EQUD Ø
620 EQUD service
630 EQUD title
640 EQUD help
650 EQUD Ø
660 EQUD Ø
670 EQUD Ø
680 EQUD Ø
690 EQUD Ø
700 :
710 .title
720 EQUS "BAUModes"
730 EQUB Ø
740 ALIGN
750 .help
760 EQUS "BAUModes"+CHR$(9)+"1.ØØ ("+MID$(TIME$,5,11)+")"
770 EQUB Ø
780 ALIGN
790 :
800 .service
810 CMP R1,#&5Ø
820 BNE notnewmode
830 CMP R2,#newmode%
840 BNE notnewmode
850 MOV R1,#Ø
860 ADR R3,vidclist
870 ADR R4,wslist
880 .notnewmode
890 MOV pc,link
900 :
910 .vidclist
920 EQUD Ø
930 EQUD basemode%
940 EQUD ((%1ØØØØØØØ)<<24)+(((hcycle%-2)/2)<<14)
950 EQUD ((%1ØØØØ1ØØ)<<24)+(((hsyncwidth%-2)/2)<<14)
960 EQUD ((%1ØØØ1ØØØ)<<24)+(((hbordstart%-1)/2)<<14)
970 EQUD ((%1ØØØ11ØØ)<<24)+(((hdispstart%-k%)/2)<<14)
980 EQUD ((%1ØØ1ØØØØ)<<24)+(((hdispend%-k%)/2)<<14)
990 EQUD ((%1ØØ1Ø1ØØ)<<24)+(((hbordend%-1)/2)<<14)
1000 EQUD ((%1Ø1ØØØØØ)<<24)+(vcycle%<<14)
1010 EQUD ((%1Ø1ØØ1ØØ)<<24)+(vsyncwidth%<<14)
1020 EQUD ((%1Ø1Ø1ØØØ)<<24)+((vbordstart%-1)<<14)
1030 EQUD ((%1Ø1Ø11ØØ)<<24)+((vdispstart%-1)<<14)
1040 EQUD ((%1Ø11ØØØØ)<<24)+((vdispend%-1)<<14)
1050 EQUD ((%1Ø11Ø1ØØ)<<24)+((vbordend%-1)<<14)
1060 EQUD -1
1070 :
1080 .wslist
1090 EQUD Ø
1100 EQUD basemode%
1110 EQUD Ø:EQUD Ø
1120 EQUD 1:EQUD maxcol%-1
1130 EQUD 2:EQUD maxrow%-1
1140 EQUD 3:EQUD colours%-1
1150 EQUD 4:EQUD 1
1160 EQUD 5:EQUD 2
1170 EQUD 6:EQUD hpix% DIV pixelsperbyte%
1180 EQUD 7:EQUD screensize%
1190 EQUD 11:EQUD hpix%-1
1200 EQUD 12:EQUD vpix%-1
1210 EQUD -1
1220 ]:NEXT pass%
1230 :
1240 PRINT"Module assembled in ";P%;" bytes"
1250 PROCins("BAUModes")
1260 INPUT"Save as: "save$
1270 SYS "OS_File",1Ø,save$,&FFA,,code%,O%
1280 OSCLI("RMLOAD "+save$)
1290 MODE newmode%
1300 END
1310 :
1320 DEF PROCins(i$)
1330 FOR i%=1 TO LEN(i$)
1340 SYS "OS_Byte",138,Ø,ASCMID$(i$,i%)
1350 NEXT
1360 ENDPROC
```

STRUM

Listing 1

```
10 REM STRUM
20 REM by Mike Smith
30 REM for B/B+/M/C
40 REM (c) BAU May 199Ø
50 :
60 *TV255,1
70 MODE7
80 PRINTCHR$141;CHR$132;CHR$157;CHR$131;SPC(4);"STRUM by Mike Smith (c)1989";SPC(4)
90 PRINTCHR$141;CHR$132;CHR$157;CHR$131;SPC(4);"STRUM by Mike Smith (c)1989";SPC(4)
100 *FX225,2ØØ
110 *FX226,21Ø
120 *FX227,22Ø
130 *FX228,23Ø
140 *FX11,Ø
150 DIM n%(1Ø),np%(1Ø),c$(6Ø),p%(9,7),ins$(9),e%(9,12),d%(5Ø),pat$(11),seq$(9),rhythm$(9),rseq$(9),racc$(9),kb 512,kc 25
160 FOR i%=Ø TO 9:seq$(i%)=STRING$(32,"'"):rseq$(i%)=STRING$(32,"Ø"):racc$(i%)=STRING$(32,"/"):NEXT
170 A%=Ø:B%=Ø:C%=1Ø:D%=1:E%=Ø:F%=1:G%=Ø:H%=1:I%=1:J%=Ø:K%=Ø:L%=Ø:M%=Ø:N%=Ø:O%=Ø:P%=1:Q%=512:R%=Ø:S%=Ø:T%=Ø:U%=Ø:V%=Ø:W%=Ø:Z%=Ø:d%(1)=Ø:name$="newsong":c$(1Ø)="'"
180 ch%=1:max%=8:tempo%=16:int%=Ø:sync%=Ø:flush%=&1Ø:rand%=Ø:dur%=8:tran%=Ø:ctran%=Ø:ktran%=Ø:btran%=91:strict%=Ø:li%=1:lr%=Ø:lc%=Ø:lp%=Ø:lastpar%=Ø:soft%=16
190 note$="c d ef g a bkC D EF G A BK"
200 par$="nm,.sldhcavgfz kjx;:~NM<>SLDHCAVGFZ KJX"
210 Keyboard$=CHR$9+"1q2we4r5t6yu8i9op-@^[\_"+CHR$139
220 RESTORE 23Ø:i%=Ø:REPEAT i%=i%+1:READ kc?i%:UNTIL i%=25
230 DATA 97,49,17,5Ø,34,35,19,52,2Ø,36,53,69,54,22,38,39,55,56,24,72,25,57,121,41,58
240 PROCdefaultdrums
250 PROCdefaultchords
260 PROCdefaultrhythms
270 PROCdefaultinstruments
280 PROCinstrument(I%)
290 ENVELOPE 3,1,Ø,Ø,Ø,Ø,Ø,Ø,126,-1Ø,Ø,-5,126,1Ø4
300 ENVELOPE 4,1,Ø,Ø,Ø,Ø,Ø,Ø,126,-1Ø,Ø,-5,112,88
310 ENVELOPE 5,1,Ø,Ø,Ø,Ø,Ø,Ø,3Ø,-1Ø,Ø,-1,12Ø,8Ø
320 ENVELOPE 6,1,Ø,Ø,Ø,Ø,Ø,Ø,3Ø,-1Ø,Ø,-1,1Ø4,64
330 ENVELOPE 7,129,-2,Ø,Ø,126,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
340 ENVELOPE 8,129,2,Ø,Ø,126,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø
350 ENVELOPE 9,1,Ø,Ø,Ø,Ø,Ø,Ø,126,-1Ø,Ø,-1,126,1Ø4
360 ENVELOPE 1Ø,1,Ø,Ø,Ø,Ø,Ø,Ø,126,-1Ø,Ø,-1,112,88
370 ENVELOPE 11,6,-1,1,-1,1,1,1,12Ø,-5,Ø,-1Ø,12Ø,8Ø
380 Input$="abcdefgkABCDEFGK#vmM+-s123456789'/()"+CHR$127
390 ON ERROR GOTO 17ØØ
400 VDU28,Ø,24,39,2,23,1,Ø;Ø;Ø;Ø;
410 *FX2Ø2,32
420 *FX4,Ø
430 :
440 CLS:PRINT'CHR$129;"      MENU:  Enter selection..."'
450 PRINTCHR$134;"<Q>  ";CHR$131;"Quit program"
460 PRINTCHR$134;"<C>  ";CHR$131;"enter or edit Chord sequence"
470 PRINTCHR$134;"<D>  ";CHR$131;"enter or edit Drum sequence"
480 PRINTCHR$134;"<P>  ";CHR$131;"Play chords, drums, or keyboard"
490 PRINTCHR$134;"<K>  ";CHR$131;"record Keyboard sequence"
500 PRINTCHR$134;"<E>  ";CHR$131;"replay or Edit keyboard sequence"
510 PRINTCHR$134;"<L>  ";CHR$131;"Load"
520 PRINTCHR$134;"<S>  ";CHR$131;"Save"
530 PRINTCHR$134;"<I>  ";CHR$131;"default Instruments"
540 PRINTCHR$134;"<M>  ";CHR$131;"default drum patterns"
550 PRINTCHR$134;"<R>  ";CHR$131;"default chord Rhythms"
560 PRINTCHR$134;"<F>  ";CHR$131;"edit Fkey chords"
570 PRINT'CHR$129;"<ESCAPE> to return to Menu":PROCfkeys
580 :
590 REPEAT k$=GET$
600 IF k$="C" PROCedit(Ø)
610 IF k$="D" PROCedit(1)
620 IF k$="P" A%=Ø:PROCplay
630 IF k$="K" A%=1:G%=1:Q%=512:PROCplay
640 IF k$="E" A%=2:G%=1:PROCplay
650 IF k$="L" PROCload:PROCfkeys
660 IF k$="S" PROCsave
670 IF k$="I" PROCdefaultinstruments:PROCfkeys
680 IF k$="R" PROCdefaultrhythms:PROCfkeys
690 IF k$="M" PROCdefaultdrums:PROCfkeys
700 IF k$="F" PROCdefchord
710 UNTIL k$="Q"
720 :
730 VDU26,12,23,1,1;Ø;Ø;Ø;
740 *FX4,Ø
750 *FX12,Ø
760 END
770 :
780 DEF PROCchord(c$)
790 LOCAL r%
800 r%=INSTR(note$,LEFT$(c$,1))
810 IF r%>13 E%=1:r%=r%-13 ELSE E%=2
820 IF r%=13 U%=VAL(RIGHT$(c$,1)):ENDPROC ELSE U%=Ø
830 IF INSTR(c$,"#") r%=r%+1
840 IF INSTR(c$,"v") r%=r%-1
850 r%=1+r%*4:p%(Ø,Ø)=r%:p%(Ø,1)=r%:p%(Ø,2)=r%+16:p%(Ø,3)=r%+28:p%(Ø,4)=r%+48:p%(Ø,5)=r%+64:p%(Ø,6)=r%+76:p%(Ø,7)=r%+96
860 IF INSTR(c$,"m") OR INSTR(c$,"-") p%(Ø,2)=p%(Ø,2)-4:p%(Ø,5)=p%(Ø,5)-4
870 IF INSTR(c$,"7") OR INSTR(c$,"11") p%(Ø,4)=p%(Ø,4)-8:p%(Ø,7)=p%(Ø,7)-8
880 IF INSTR(c$,"M7") p%(Ø,4)=p%(Ø,4)-4:p%(Ø,7)=p%(Ø,7)-4
```

Continued ▶

YELLOW PAGES

STRUM

◀ Continued

```
890 IF INSTR(c$,"+") p%(Ø,3)=p%(Ø,3)+4:p%(Ø,6)=p%(Ø,6)+4
900 IF INSTR(c$,"-") p%(Ø,3)=p%(Ø,3)-4:p%(Ø,6)=p%(Ø,6)-4
910 IF INSTR(c$,"s") p%(Ø,2)=p%(Ø,2)+4:p%(Ø,5)=p%(Ø,5)+4
920 IF INSTR(c$,"6") p%(Ø,3)=p%(Ø,3)+8:p%(Ø,6)=p%(Ø,6)+8
930 IF INSTR(c$,"9") OR INSTR(c$,"13") p%(Ø,4)=p%(Ø,4)+8:p%(Ø,7)=p%(Ø,7)+8
940 IF INSTR(c$,"11") p%(Ø,2)=p%(Ø,2)+4:p%(Ø,5)=p%(Ø,5)+4
950 IF INSTR(c$,"13") p%(Ø,3)=p%(Ø,3)+8:p%(Ø,6)=p%(Ø,6)+8
960 ENDPROC
970 :
980 DEF PROCstrum
990 LOCAL n%,no%,note%:note%=4-int%*4
1000 IF R% OR strict% no%=1 ELSE no%=RND(4)
1010 REPEAT n%=n%+1:B%=B%MODQ%+1
1020 REPEAT PROCpar(INKEY(Ø)):UNTIL Z%=Ø
1030 IF R% note%=VAL(MID$(rseq$(R%),n%,1)):E%=VAL(MID$(racc$(R%),n%,1)) ELSE IF int% note%=note%+int% ELSE note%=note%+SGN(RND)*RND(2)
1040 IF note%>7 OR note%<Ø note%=4-int%*3
1050 IF rand%=Ø REPEAT UNTIL TIME>=tempo%:TIME=Ø
1060 IF n%=1 AND J% PRINTc$(J%);" "; ELSE IF n%=1 PRINTc$(c%);" ";
1070 IF (n%-1)MODno%=Ø AND H% SOUND FNrest+sync%+flush%+ch%,E%,p%(U%,note%)+tran%+ctran%,dur%:ch%=ch%MOD(3-G%)+1
1080 IF (n%-1)MODno%=Ø AND H% AND sync%>Ø SOUND FNrest+sync%+flush%+ch%,E%,p%(U%,note%MOD7+1)+tran%+ctran%,dur%:ch%=ch%MOD(3-G%)+1
1090 IF (n%-1)MODno%=Ø AND H% AND sync%>1 SOUND FNrest+sync%+flush%+ch%,E%,p%(U%,note%MOD6+2)+tran%+ctran%,dur%:ch%=ch%MOD(3-G%)+1
1100 IF D% PROCdrum(MID$(perc$,n%,1))
1110 UNTIL n%>=max%
1120 IF rand% REPEAT UNTIL TIME>=tempo%*max%:TIME=Ø
1130 ENDPROC
1140 :
1150 DEF FNrest
1160 =-(note%=Ø OR (c$(c%)="'" AND J%=Ø) OR c$(J%)="'")*&1ØØØ
1170 :
1180 DEF PROCparmenu
1190 *FX2Ø2,48
1200 X%=POS:Y%=VPOS:VDU28,Ø,16,39,2
1210 CLS:PRINT'CHR$129;"Playing";CHR$135;name$;CHR$129;"<CPY> env <TAB> rhythm"'
1220 PRINTCHR$134;"<[]> ";CHR$131;"tempo"TAB(3Ø,3)CHR$129;tempo%*max%
1230 PRINTCHR$134;"<<>> ";CHR$131;"beats per chord"TAB(3Ø,4)CHR$129;max%
1240 PRINTCHR$134;"<nm> ";CHR$131;"sustain"TAB(3Ø,5)CHR$129;dur%
1250 PRINTCHR$134;"<sl> ";CHR$131;"softer/louder"TAB(3Ø,6)CHR$129;-soft%
1260 PRINTCHR$134;"<ac> ";CHR$131;"arpeggio";CHR$131;"chords"
1270 PRINTCHR$134;"<fg> ";CHR$131;"falling";CHR$131;"rising";CHR$131;"pitch"
1280 PRINTCHR$134;"<v>  ";CHR$131;"variable pitch and timing"
1290 PRINTCHR$134;"<z>  ";CHR$131;"strict timing"
1300 PRINTCHR$134;"<dh> ";CHR$131;"transpose";CHR$129;tran%DIV4;TAB(21,11)CHR$130;"C ";ctran%DIV48;TAB(27,11)"K ";ktran%DIV48;TAB(32,11)"B ";(btran%-187)DIV48
1310 PRINTCHR$134;"<;:> ";CHR$131;"loop start/end"
1320 PRINTCHR$134;"<SPC> ";CHR$131;"Stop";CHR$134;"<K>";CHR$131;"Kbd";CHR$134;"<J>";CHR$131;"Chord";CHR$134;"<X>";CHR$131;"Drum";
1330 IF int%=Ø PRINTTAB(7,9)CHR$129; ELSE IF int%=-1 PRINTTAB(7,8)CHR$129;TAB(15,8)CHR$131; ELSE PRINTTAB(15,8)CHR$129;
1340 IF sync%=&2ØØ PRINTTAB(16,7)CHR$129; ELSE IF flush%=&1Ø PRINTTAB(7,7)CHR$129;
1350 IF strict% PRINTTAB(7,1Ø)CHR$129; ELSE PRINTTAB(7,1Ø)CHR$131;
1360 IF Z% PRINTTAB(7,13)CHR$129;
1370 IF G% PRINTTAB(16,13)CHR$129;
1380 IF H% PRINTTAB(24,13)CHR$129;
1390 IF D% PRINTTAB(34,13)CHR$129;
1400 VDU28,Ø,19,39,17,31,X%,Y%
1410 ENDPROC
1420 :
1430 DEF PROCplay
1440 LOCAL c%,tc%,l%,pp%,tpp%,pl%
1450 CLS:PROCfkeys:PROCparmenu:B%=Ø:c%=9:pp%=Ø:*FX4,1
1460 IF A%=1 PROCintro:*FX15,Ø
1470 REPEAT
1480 REPEAT c%=FNinc:tc%=c%
1490 IF c$(c%)="(" l%=l%+1:n%(l%)=c%
1500 IF c$(c%)=")" c%=n%(l%):n%(l%)=tc%:l%=l%+(c%=tc%)
1510 UNTIL c$(c%)<>"(" ANDc$(c%)<>")"
1520 REPEAT pp%=FNincp:tpp%=pp%
1530 IF d%(pp%)=1Ø pl%=pl%+1:np%(pl%)=pp%
1540 IF d%(pp%)=11 pp%=np%(pl%):np%(pl%)=tpp%:pl%=pl%+(pp%=tpp%)
1550 UNTIL d%(pp%)<>1Ø AND d%(pp%)<>11
1560 IF K% PROCperc(K%) ELSE PROCperc(d%(pp%))
1570 IF J% PROCchord(c$(J%)) ELSE IF c$(c%)<>"/" PROCchord(c$(c%))
1580 PROCstrum
1590 UNTIL FALSE
1600 ENDPROC
1610 :
1620 DEF FNinc
1630 IF c%>=C%-1 =1Ø
1640 =c%+1
1650 :
1660 DEF FNincp
1670 IF pp%>=P%-1 =1
1680 =pp%+1
1690 :
1700 ON ERROR OFF
1710 IF ERR<>17 REPORT:PRINT" at line ";ERL:CLOSE#Ø:PRINTCHR$129;"PRESS ANY KEY TO CONTINUE":k%=GET
1720 IF ERR=17 AND A%=1 Q%=B%+max%-n%+(C%-c%-1)*max%:REPEAT B%=B%+1:kb?B%=Ø:UNTIL B%>Q%
1730 IF ERR=17 V%=Ø:W%=Ø
1740 GOTO 39Ø
1750 :
1760 DEF PROCpar(k%)
1770 IF G% PROCkbd(k%)
1780 IF A%=2 AND B%=Q% AND INKEY(-2) A%=1:Q%=512
1790 IF k%=-1 ENDPROC
1800 IF k%=135 V%=(V%+1)MOD2:IF V%=Ø PROCparmenu:ENDPROC ELSE IF k%=135 PROCenvmenu:ENDPROC
1810 IF k%=9 W%=(W%+1)MOD2:IF W%=Ø PROCparmenu:ENDPROC ELSE IF k%=9 PROCrhythmmenu:ENDPROC
1820 IF k%>229 AND G%=Ø I%=k%-23Ø:PROCinstrument(I%) ELSE IF k%>229 F%=k%-23Ø:PROCinstrument(F%)
1830 IF k%>219 AND k%<23Ø R%=k%-22Ø:PROCrhythm
1840 IF k%>2Ø9 AND k%<22Ø J%=k%-21Ø:PROCchrd
1850 IF k%>199 AND k%<21Ø K%=k%-2ØØ
1860 IF V% PROCvaryenv(k%):ENDPROC
1870 IF W% PROCvaryrhythm(k%):ENDPROC
1880 IF k%>199 ENDPROC ELSE k$=CHR$k%
1890 X%=POS:Y%=VPOS:VDU28,Ø,16,39,2
1900 IF k%=136 OR k%=137 PROCtempo(k%)
1910 T%=(INSTR(par$,k$))MOD21:IF T% ON T% GOSUB 193Ø,193Ø,194Ø,194Ø,195Ø,195Ø,196Ø,196Ø,197Ø,198Ø,199Ø,2ØØØ,2Ø1Ø,2Ø2Ø,2Ø3Ø,2Ø4Ø,2Ø5Ø,2Ø6Ø,2Ø7Ø,2Ø8Ø
1920 VDU28,Ø,19,39,17,31,X%,Y%:ENDPROC
1930 PROCdur(k$):RETURN
1940 PROCmax(k$):RETURN
1950 PROCsoft(k$):RETURN
1960 PROCtran(k$):RETURN
1970 sync%=&2ØØ-&1ØØ*G%:flush%=&1Ø:rand%=Ø:PRINTTAB(7,7)CHR$131;TAB(16,7)CHR$129;:RETURN
1980 sync%=Ø:flush%=&1Ø:rand%=Ø:PRINTTAB(7,7)CHR$129;TAB(16,7)CHR$131;:RETURN
1990 int%=Ø:sync%=Ø:flush%=Ø:rand%=1:PRINTTAB(7,7)CHR$131;TAB(16,7)CHR$131;TAB(7,9)CHR$129;TAB(7,8)CHR$131;TAB(15,8)CHR$131;:RETURN
2000 int%=1:rand%=Ø:PRINTTAB(7,9)CHR$131;TAB(7,8)CHR$131;TAB(15,8)CHR$129;:RETURN
2010 int%=-1:rand%=Ø:PRINTTAB(7,9)CHR$131;TAB(7,8)CHR$129;TAB(15,8)CHR$131;:RETURN
2020 strict%=(strict%+1)MOD2:IF strict% PRINTTAB(7,1Ø)CHR$129;:RETURN ELSE PRINTTAB(7,1Ø)CHR$131;:RETURN
2030 Z%=(Z%+1)MOD2:IF Z% PRINTTAB(7,13)CHR$129;:RETURN ELSE PRINTTAB(7,13)CHR$131;:RETURN
2040 G%=(G%+1)MOD2:IF G%=Ø PRINTTAB(16,13)CHR$131;:sync%=sync%*2:RETURN ELSE PRINTTAB(16,13)CHR$129;:sync%=sync%DIV2:RETURN
2050 H%=(H%+1)MOD2:IF H% PRINTTAB(24,13)CHR$129;:RETURN ELSE PRINTTAB(24,13)CHR$131;:RETURN
2060 D%=(D%+1)MOD2:IF D% PRINTTAB(34,13)CHR$129;:RETURN ELSE PRINTTAB(34,13)CHR$131;:RETURN
2070 IF A%=2 S%=B%:RETURN
2080 IF A%=2 O%=B%:PROCloop:RETURN
2090 :
2100 DEF PROCtempo(t%)
2110 IF t%=136 tempo%=tempo%-1+9*INKEY(-1):IF tempo%<1 tempo%=1
2120 IF t%=137 tempo%=tempo%+1-9*INKEY(-1)
2130 PRINTTAB(31,3);tempo%*max%;"  "
2140 ENDPROC
2150 :
2160 DEF PROCdur(d$)
2170 IF INSTR("nN",d$) dur%=dur%-1:IF dur%<1 dur%=1
2180 IF INSTR("mM ",d$) dur%=dur%+1:IF dur%>255 dur%=255
2190 PRINTTAB(31,5);dur%;"  "
2200 ENDPROC
2210 :
2220 DEF PROCsoft(s$)
2230 IF INSTR("sS",s$) soft%=soft%+8:PROCenv
2240 IF INSTR("lL",s$) soft%=soft%-8:PROCenv
2250 PRINTTAB(31,6);-soft%;"  "
2260 ENDPROC
2270 :
2280 DEF PROCmax(m$)
2290 IF INSTR(",<",m$) max%=max%-1:IF max%<1 max%=1
2300 IF INSTR(".>",m$) max%=max%+1
2310 PRINTTAB(31,3);tempo%*max%;"  "TAB(31,4);max%;"  "
2320 ENDPROC
2330 :
2340 DEF PROCtran(t$)
2350 IF t$="d" tran%=tran%-4:IF tran%<Ø tran%=Ø
2360 IF t$="h" tran%=tran%+4:IF tran%>48 tran%=48
2370 IF t$="D" ktran%=ktran%-48*G%:ctran%=ctran%-48*H%*(1-G%):btran%=btran%-48*D%*(1-H%)*(1-G%)
2380 IF ctran%<Ø ctran%=Ø
2390 IF ktran%<Ø ktran%=Ø
2400 IF btran%<-5 btran%=-5
2410 IF t$="H" ktran%=ktran%+48*G%:ctran%=ctran%+48*H%*(1-G%):btran%=btran%+48*D%*(1-H%)*(1-G%)
2420 IF ctran%>144 ctran%=144
2430 IF ktran%>144 ktran%=144
2440 IF btran%>187 btran%=187
2450 PRINTTAB(18,11);tran%DIV4;" "TAB(24,11);ctran%DIV48;" "TAB(29,11);ktran%DIV48;" "TAB(34,11);(btran%-187)DIV48;" "
2460 ENDPROC
2470 :
2480 DEF PROCkbd(b%)
2490 N%=INSTR(Keyboard$,CHR$b%)
2500 IF N% L%=kc?N%:k%=-1 ELSE N%=INKEY(-L%)
2510 IF A%=1 OR (A%=2 AND N%<>Ø) kb?B%=N%
2520 IF A%=2 AND b%=127 kb?B%=Ø
2530 IF A%=2 N%=kb?B%
2540 IF N%=-1 OR N%=255 ENDPROC
2550 IF N%=Ø SOUND &1Ø13,Ø,Ø,-1:ENDPROC
2560 SOUND &13,11,1+tran%+ktran%+4*N%,-1
2570 ENDPROC
2580 :
2590 DEF PROCintro
2600 FOR i%=Ø TO 4
2610 SOUND &1Ø,3,Ø,1
2620 REPEAT UNTIL TIME>=tempo%*max%:TIME=Ø
2630 NEXT
2640 ENDPROC
2650 :
2660 DEF PROCloop
2670 REPEAT B%=S%-1
2680 REPEAT B%=B%MODQ%+1
2690 REPEAT UNTIL TIME>=tempo%:TIME=Ø
2700 PROCkbd(INKEY(Ø))
2710 UNTIL B%=O% OR INKEY(-99)
2720 UNTIL INKEY(-99)
2730 ENDPROC
2740 :
2750 DEF PROCslmenu
2760 VDU23,1,1;Ø;Ø;Ø;
2770 PRINTCHR$134;"<A>";CHR$131"All"
2780 PRINTCHR$134;"<C>";CHR$131"Chords"
2790 PRINTCHR$134;"<D>";CHR$131"Drums"
2800 PRINTCHR$134;"<K>";CHR$131"Keyboard"
2810 PRINTCHR$134;"<I>";CHR$131"Instruments"
2820 PRINTCHR$134;"<R>";CHR$131"Rhythms"
2830 PRINTCHR$134;"<*>";CHR$131"O.S. Command"
2840 VDU28,Ø,24,39,13,14
2850 REPEAT:REPEAT D$=GET$:UNTIL INSTR("ACDKIR*",D$):IF D$="*" PROCos
2860 UNTIL INSTR("ACDKIR",D$)
2870 ENDPROC
2880 :
2890 DEF PROCos
2900 REPEAT CLS:PRINTCHR$129;"Enter O.S. command <RETURN> to continue":INPUT" *"os$
2910  OSCLI("*"+os$):IF os$<>"" k%=GET
2920 UNTIL os$="":CLS
2930 ENDPROC
2940 :
2950 DEF PROCsave
2960 CLS:PRINT'CHR$129;"Saving to disc..."'
2970 PROCslmenu
2980 REPEAT CLS:PRINT'CHR$131;"Enter filename to save..."'
2990 INPUT""name$:N%=OPENIN(D$+"."+name$)
3000 IF N%>Ø PRINT'CHR$129;"File already exists! OK? <Y/N>":k$=GET$
3010 UNTIL N%=Ø OR k$="Y" OR k$="y":CLOSE#Ø:N%=OPENOUT(D$+"."+name$)
3020 IF D$="A" PRINT#N%,tempo%,dur%,sync%,flush%,rand%,int%,tran%,ctran%,btran%,ktran%,max%,strict%,soft%,D%,F%,G%,H%,I%,J%,K%,R%
3030 IF D$="C" OR D$="A" PRINT#N%,C%:FOR c%=Ø TO C%:PRINT#N%,c$(c%):NEXT
3040 IF D$="D" OR D$="A" PRINT#N%,P%:FOR c%=Ø TO P%:PRINT#N%,d%(c%):NEXT:FOR key%=Ø TO 9:PRINT#N%,pat$(key%),seq$(key%):NEXT
3050 IF D$="K" OR D$="A" PRINT#N%,Q%:FOR b%=Ø TO Q%:PRINT#N%,kb?b%:NEXT
3060 IF D$="I" OR D$="A" FOR key%=Ø TO 9:PRINT#N%,ins$(key%):FOR par%=Ø TO 12:PRINT#N%,e%(key%,par%):NEXT:NEXT
3070 IF D$="R" OR D$="A" FOR key%=Ø TO 9:PRINT#N%,rhythm$(key%),rseq$(key%),racc$(key%):NEXT
3080 CLOSE#Ø:VDU15:*FX125
3090 ENDPROC
3100 :
3110 DEF PROCload
3120 CLS:PRINT'CHR$129;"Loading from disc..."'
3130 PROCslmenu
3140 REPEAT CLS:PRINT'CHR$131;"Enter filename to load..."'
3150 INPUT""name$:N%=OPENIN(D$+"."+name$)
3160 IF N%=Ø PRINT'CHR$129;"No file on disc! <RETURN> to continue":K%=GET
3170 UNTIL N%>Ø
3180 IF D$="A" INPUT#N%,tempo%,dur%,sync%,flush%,rand%,int%,tran%,ctran%,btran%,ktran%,max%,strict%,soft%,D%,F%,G%,H%,I%,J%,K%,R%
3190 IF D$="C" OR D$="A" INPUT#N%,C%:FOR c%=Ø TO C%:INPUT#N%,c$(c%):NEXT
3200 IF D$="D" OR D$="A" INPUT#N%,P%:FOR c%=Ø TO P%:INPUT#N%,d%(c%):NEXT:FOR key%=Ø TO 9:INPUT#N%,pat$(key%),seq$(key%):NEXT
3210 IF D$="K" OR D$="A" INPUT#N%,Q%:FOR b%=Ø TO Q%:INPUT#N%,kb?b%:NEXT
3220 IF D$="I" OR D$="A" FOR key%=Ø TO 9:INPUT#N%,ins$(key%):FOR par%=Ø TO 12:INPUT#N%,e%(key%,par%):NEXT:NEXT
3230 IF D$="R" OR D$="A" FOR key%=Ø TO 9:INPUT#N%,rhythm$(key%),rseq$(key%),racc$(key%):NEXT
3240 CLOSE#Ø:VDU15:*FX125
3250 ENDPROC
3260 :
3270 DEF PROCperc(d%)
3280 X%=POS:Y%=VPOS:VDU28,Ø,24,39,2
3290 PRINTTAB(lp%*4,21)CHR$131;TAB(d%*4,21)CHR$129;
3300 IF d%<>9 PRINTTAB(d%*4+4,21)CHR$131;
3310 lp%=d%:perc$=seq$(d%):VDU28,Ø,19,39,17,31,X%,Y%
3320 ENDPROC
3330 :
3340 DEF PROCchrd
3350 X%=POS:Y%=VPOS:VDU28,Ø,24,39,2
3360 PRINTTAB(lc%*4,2Ø)CHR$135;TAB(J%*4,2Ø)CHR$129;
3370 IF J%<>9 PRINTTAB(J%*4+4,2Ø)CHR$135;
3380 lc%=J%:VDU28,Ø,19,39,17,31,X%,Y%
3390 ENDPROC
3400 :
3410 DEF PROCrhythm
3420 X%=POS:Y%=VPOS:VDU28,Ø,24,39,2
3430 PRINTTAB(lr%*4,19)CHR$13Ø;TAB(R%*4,19)CHR$129;
3440 IF R%<>9 PRINTTAB(R%*4+4,19)CHR$13Ø;
3450 IF R% max%=LENrseq$(R%):IF max%=Ø max%=1
3460 lr%=R%:VDU28,Ø,19,39,17,31,X%,Y%
3470 ENDPROC
3480 :
3490 DEF PROCinstrument(i%)
3500 X%=POS:Y%=VPOS:VDU28,Ø,24,39,2
3510 PRINTTAB(li%*4,18)CHR$134;TAB(i%*4,18)CHR$129;
3520 IF i%<>9 PRINTTAB(i%*4+4,18)CHR$134;
3530 li%=i%:PROCenv:VDU28,Ø,19,39,17,31,X%,Y%
3540 ENDPROC
3550 :
3560 DEF PROCenv
3570 IF G% i%=F% ELSE i%=I%
3580 ENVELOPE 1+1Ø*G%,e%(i%,Ø),e%(i%,1),e%(i%,2),e%(i%,3),e%(i%,4),e%(i%,5),e%(i%,6),e%(i%,7),e%(i%,8),e%(i%,9),e%(i%,1Ø),e%(i%,11),e%(i%,12)
3590 IF G% ENDPROC
3600 ENVELOPE 2,e%(i%,Ø),e%(i%,1),e%(i%,2),e%(i%,3),e%(i%,4),e%(i%,5),e%(i%,6),e%(i%,7),e%(i%,8),e%(i%,9),e%(i%,1Ø),e%(i%,11)-soft%,e%(i%,12)-soft%
3610 ENDPROC
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3620 :
3630 DEF PROCdefaultinstruments
3640 RESTORE 37ØØ
3650 FOR key%=Ø TO 9
3660 READ ins$(key%)
3670 FOR par%=Ø TO 12
3680 READ e%(key%,par%)
3690 NEXT:NEXT
3700 DATA squ,1,Ø,Ø,Ø,Ø,Ø,Ø,8Ø,Ø,Ø,-8Ø,8Ø,8Ø
3710 DATA syn,6,-1,1,-1,1,1,1,12Ø,-5,Ø,-1Ø,12Ø,8Ø
3720 DATA pno,5,Ø,Ø,Ø,Ø,Ø,Ø,12Ø,-5,-2,-2Ø,12Ø,8Ø
3730 DATA eco,12,Ø,8,12,1,1,1,12Ø,-8,-1,-1Ø,12Ø,8Ø
3740 DATA pan,1,Ø,1,-2,1,1,1,2Ø,-3,Ø,-5,12Ø,8Ø
3750 DATA vib,8,-1,1,-1,1,1,1,126,-8,-4,-4,12Ø,8Ø
3760 DATA org,1,Ø,Ø,Ø,Ø,Ø,Ø,1Ø,5,Ø,-2Ø,8Ø,1ØØ
3770 DATA ham,4,-1,1,-1,1,1,1,2Ø,1Ø,Ø,-3Ø,8Ø,1ØØ
3780 DATA wnd,1,Ø,Ø,Ø,Ø,Ø,Ø,5Ø,Ø,Ø,-15,1ØØ,1ØØ
3790 DATA str,8,-1,1,-1,1,1,1,1Ø,5,Ø,-5,8Ø,1ØØ
3800 ENDPROC
3810 :
3820 DEF PROCheader
3830 CLS:PRINT'CHR$129;"Enter or edit chords on function keys:"'
3840 PROCinputmenu
3850 PRINT'CHR$134;"<fkey>";CHR$131;"select function key"
3860 PRINTCHR$134;"<TAB> ";CHR$131;"default chords"
3870 PROCfkeys
3880 ENDPROC
3890 :
3900 DEF PROCdefchord
3910 PROCheader:VDU23,1,1;Ø;Ø;Ø;
3920 REPEAT VDU31,J%*4+1,2Ø:PROCinput
3930 IF in$="k" OR in$="K" c$(J%)=in$+STR$(J%):PROCdefnotes(J%):PROCheader
3940 IF k%=9 PROCdefaultchords:PROCfkeys
3950 IF k%>21Ø AND k%<22Ø J%=k%-21Ø:PROCchrd:VDU28,Ø,24,39,2
3960 IF k%=13 c$(J%)=in$
3970 UNTIL FALSE
3980 ENDPROC
3990 :
4000 DEF PROCdefnotes(k%)
4010 CLS:PRINT'CHR$129;"Enter pitch of notes for harmony k";k%;"..."
4020 FOR i%=1 TO 12:PRINTTAB(Ø,i%+2)CHR$133;MID$("B A G FE D C",i%,1);CHR$135;:NEXT
4030 FOR i%=1 TO 12:FOR j%=1 TO 5:PRINTTAB(j%*5,15-i%);i%*4+1+(j%-1)*48:NEXT,
4040 PRINTTAB(Ø,16)CHR$134;"Pitch of note ";:i%=-1
4050 REPEAT i%=i%+1
4060 PRINTTAB(15,16);i%;":";CHR$135;"  ";
4070 INPUTTAB(19,16)""p%(k%,i%)
4080 UNTIL i%=7
4090 ENDPROC
4100 :
4110 DEF PROCdefaultchords
4120 RESTORE 414Ø
4130 FOR key%=Ø TO 9:READ c$(key%):NEXT
4140 DATAseq,c,dm,em,f,g7,am,b-,cM7,'
4150 ENDPROC
4160 :
4170 DEF PROCfkeys
4180 PRINTTAB(Ø,18)CHR$134;:FOR key%=Ø TO 9:PRINTTAB(key%*4+1,18)ins$(key%);:NEXT
4190 PRINTTAB(Ø,19)CHR$13Ø;:FOR key%=Ø TO 9:PRINTTAB(key%*4+1,19)rhythm$(key%);:NEXT
4200 FOR key%=Ø TO 9:PRINTTAB(key%*4+1,2Ø)c$(key%);:NEXT
4210 PRINTTAB(Ø,21)CHR$131;:FOR key%=Ø TO 9:PRINTTAB(key%*4+1,21)pat$(key%);:NEXT
4220 PRINTTAB(Ø,22)CHR$129;"fØ  f1  f2  f3  f4  f5  f6  f7  f8  f9";
4230 PRINTTAB(li%*4,18)CHR$129;
4240 IF li%<>9 PRINTTAB(li%*4+4,18)CHR$134;
4250 PRINTTAB(lr%*4,19)CHR$129;
4260 IF lr%<>9 PRINTTAB(lr%*4+4,19)CHR$13Ø;
4270 PRINTTAB(lp%*4,21)CHR$129;
4280 IF lp%<>9 PRINTTAB(lp%*4+4,21)CHR$131;
4290 PRINTTAB(lc%*4,2Ø)CHR$129;
4300 IF lc%<>9 PRINTTAB(lc%*4+4,2Ø)CHR$135;
4310 ENDPROC
4320 :
4330 DEF PROCinputmenu
4340 *FX2Ø2,48
4350 PRINTCHR$134;"abcdefg(k)";CHR$131;"Root Note";CHR$134;"ABCDEFG(K)";CHR$131;"Accent"
4360 PRINTCHR$134;"#";CHR$131;"Sharp,";CHR$134;"v";CHR$131;"Flat"
4370 PRINTCHR$134;"m";CHR$131;"Minor,";CHR$134;"M";CHR$131;"Major"
4380 PRINTCHR$134;"+";CHR$131;"Augmented,";CHR$134;"-";CHR$131;"Diminished"
4390 PRINTCHR$134;"s";CHR$131;"Suspended Fourth"
4400 PRINTCHR$134;"6";CHR$131;"Sixth,";CHR$134;"7";CHR$131;"Seventh,";CHR$134;"9";CHR$131;"Ninth"
4410 PRINTCHR$134;"11";CHR$131;"Eleventh,";CHR$134;"13";CHR$131;"Thirteenth"
4420 PRINTCHR$134;"/";CHR$131;"Repeat chord,";CHR$134;"'";CHR$131;"Rest"
4430 ENDPROC
4440 :
4450 DEF PROCinput
4460 in$=""
4470 REPEAT k%=GET:k$=CHR$k%
4480 IF INSTR(Input$,k$) in$=in$+k$:PRINTk$;
4490 IF k%=127 in$=LEFT$(in$,LEN(in$)-2)
4500 UNTIL k%=9 OR k%=13 OR k%=78 OR k%>127
4510 ENDPROC
4520 :
4530 DEF PROCedit(p%)
4540 LOCAL mn%,mx%:in$=""
4550 IF p% mn%=1:mx%=P% ELSE mn%=1Ø:mx%=C%
4560 *FX4,1
4570 CLS:IF p% PRINT'CHR$129;"Enter or edit drum/bass sequence:"''CHR$134;"<fkey>";CHR$131;"to enter pattern":GOTO 459Ø
4580 PRINT'CHR$129;"Enter or edit chord sequence:"':PROCinputmenu
4590 PRINTCHR$134;"(";CHR$131;"Start sequence,";CHR$134;")";CHR$131;"Repeat sequence"'CHR$134;"<CSR>";CHR$131;"Select";CHR$134;"<TAB>";CHR$131;"Delete";CHR$134;"<COPY>";CHR$131;"Insert";CHR$134;"<N>";CHR$131;"New or clear sequence"
4600 IF p% PROCfkeys:VDU28,Ø,18,39,11:PROCprintpats ELSE VDU28,Ø,24,39,17:PROCprintchords
4610 VDU23,1,1;Ø;Ø;Ø;
4620 c%=mn%:lcd%=mn%:PROChighlight
4630 REPEAT
4640 IF p% k%=GET ELSE PROCinput
4650 IF k%=78 AND p% P%=1:c%=1:lcd%=1:d%(1)=Ø:PROCprintpats ELSE IF k%=78 C%=1Ø:c%=1Ø:lcd%=1Ø:c$(1Ø)="'":PROCprintchords
4660 IF k%=136 c%=c%-1:IF c%<mn% c%=mn%
4670 IF k%=137 c%=c%+1:IF c%>mx% c%=mx%
4680 IF k%=138 c%=c%+8:IF c%>mx% c%=mx%
4690 IF k%=139 c%=c%-8:IF c%<mn% c%=mn%
4700 IF k%=4Ø OR k%=41 AND p% p%(c%)=k%-3Ø:PRINTpat$(k%-3Ø):IF c%=P% P%=P%+1:c%=P%
4710 IF k%>199 AND k%<21Ø d%(c%)=k%-2ØØ:PRINTpat$(k%-2ØØ);:IF c%=P% P%=P%+1:c%=P%
4720 IF k%=13 AND p%=Ø c$(c%)=in$:PRINTSPC(5-LENin$):IF c%=C% C%=C%+1:c%=C%
4730 IF k%=9 AND p% AND P%>c% PROCdeletepat ELSE IF k%=9 AND p%=Ø AND C%>c% PROCdeletechord
4740 IF k%=135 AND p% PROCinsertpat ELSE IF k%=135 PROCinsertchord
4750 IF p% mx%=P% ELSE mx%=C%
4760 PROChighlight
4770 UNTIL C%=6Ø OR P%=5Ø
4780 ENDPROC
4790 :
4800 DEF PROCdeletechord
4810 FOR i%=c% TO C%-1:c$(i%)=c$(i%+1):NEXT
4820 C%=C%-1:IF C%=1Ø c$(1Ø)="'"
4830 PROCprintchords
4840 ENDPROC
4850 :
4860 DEF PROCdeletepat
4870 FOR i%=c% TO P%-1:d%(i%)=d%(i%+1):NEXT
4880 P%=P%-1:IF P%=1 d%(1)=Ø
4890 PROCprintpats
4900 ENDPROC
4910 :
4920 DEF PROCinsertchord
4930 FOR i%=C% TO c%+1 STEP -1:c$(i%)=c$(i%-1):NEXT
4940 C%=C%+1:c$(c%)="":PROCprintchords
4950 ENDPROC
4960 :
4970 DEF PROCinsertpat
4980 FOR i%=P% TO c%+1 STEP -1:d%(i%)=d%(i%-1):NEXT
4990 P%=P%+1:PROCprintpats
5000 ENDPROC
5010 :
5020 DEF PROCprintchords
5030 CLS:FOR i%=1Ø TO C%-1:PRINTTAB(((i%-1Ø)MOD8)*5+1,(i%-1Ø)DIV8)c$(i%);:NEXT
5040 ENDPROC
5050 :
5060 DEF PROCprintpats
5070 CLS:FOR i%=1 TO P%-1:PRINTTAB(((i%-1)MOD8)*5+1,(i%-1)DIV8)pat$(d%(i%));:NEXT
5080 ENDPROC
5090 :
5100 DEF PROChighlight
5110 PRINTTAB(((lcd%-mn%)MOD8)*5,(lcd%-mn%)DIV8)CHR$135;
5120 PRINTTAB(((c%-mn%)MOD8)*5,(c%-mn%)DIV8)CHR$129;
5130 IF ((c%-mn%)MOD8)*5+5<39 PRINTTAB(((c%-mn%)MOD8)*5+5,(c%-mn%)DIV8)CHR$135;
5140 lcd%=c%
5150 VDU31,((c%-mn%)MOD8)*5+1,(c%-mn%)DIV8
5160 ENDPROC
5170 :
5180 DEF PROCdrum(d$)
5190 LOCAL env%,pitch%
5200 IF d$="'" OR d$="" OR d$=" " ENDPROC
5210 IF INSTR("HMLDRCTPWBN",d$) env%=3:d$=CHR$(ASC(d$)+32) ELSE env%=4
5220 pitch%=INSTR("..phmlw",d$)+INSTR("..bcr.d",d$)
5230 IF d$="t" SOUND&1Ø+ch%,env%+6,245,1:ch%=ch%MOD(3-G%)+1:ENDPROC
5240 IF d$="c" env%=env%+6:SOUND&1Ø+ch%,env%,255,1:ch%=ch%MOD(3-G%)+1
5250 IF d$="d" SOUND&11,Ø,128,-1:ch%=2
5260 IF d$="r" SOUND&1Ø,env%+2,pitch%,dur%:ENDPROC
5270 IF d$="p" SOUND&11,7,255,1:IF ch%=1 ch%=2
5280 IF d$="w" SOUND&11,8,15Ø,1:env%=env%+6:IF ch%=1 ch%=2
5290 IF d$="b" SOUND&11,Ø,p%(U%,note%)+tran%+btran%,-1:env%=env%+6:IF ch%=1 ch%=2
5300 IF d$="n" SOUND&1Ø+ch%,env%-2,p%(U%,note%)+tran%+ctran%,dur%:ch%=ch%MOD(3-G%)+1:ENDPROC
5310 SOUND&1Ø,env%,pitch%,1
5320 ENDPROC
5330 :
5340 DEF PROCdefaultdrums
5350 RESTORE 537Ø
5360 FOR key%=Ø TO 9:READ pat$(key%),seq$(key%):NEXT
5370 DATA seq,'''''''',snr,H''hM'll,drm,D''''ddd,cym,C'''c''',tri,T''tt''',p/w,P'''w''',brs,R'''r''r,bss,B'bbB'bb,nte,N'n'nnn',rst,''''''''
5380 pat$(1Ø)="(":pat$(11)=")"
5390 ENDPROC
5400 :
5410 DEF PROCdefaultrhythms
5420 RESTORE 544Ø
5430 FOR key%=Ø TO 9:READ rhythm$(key%),rseq$(key%),racc$(key%):NEXT
5440 DATA off, , ,arp,1234567Ø,12222222,2/4,2Ø4Ø1Ø76,12221222,3/4,1ØØ32ØØ41567,122212221222,4/4,2Ø561Ø3Ø2ØØØ1ØØ4,1222122212221222,5/4,1Ø452Ø671Ø4Ø34561765,12221222122212221222,6/8,1Ø3Ø2Ø574Ø6Ø,122222222222
5450 DATA 7/8,1ØØØ342Ø6Ø1567,12222222222222,8/8,1Ø2Ø5Ø431Ø7Ø625Ø,1222222222222222,9/8,2Ø6Ø1Ø3Ø2Ø4Ø1Ø6725,122222122222122222
5460 ENDPROC
5470 :
5480 DEF PROCenvmenu
5490 X%=POS:Y%=VPOS:VDU28,Ø,16,39,2
5500 CLS:PRINTCHR$135;ins$(I%);CHR$129"<^v> parameter <[]> value"
5510 PRINTCHR$131;"time unit        ";CHR$134;e%(I%,Ø)
5520 PRINTCHR$131;"pitch increase 1 ";CHR$134;e%(I%,1)
5530 PRINTCHR$131;"pitch increase 2 ";CHR$134;e%(I%,2)
5540 PRINTCHR$131;"pitch increase 3 ";CHR$134;e%(I%,3)
5550 PRINTCHR$131;"pitch number   1 ";CHR$134;e%(I%,4)
5560 PRINTCHR$131;"pitch number   2 ";CHR$134;e%(I%,5)
5570 PRINTCHR$131;"pitch number   3 ";CHR$134;e%(I%,6)
5580 PRINTCHR$131;"attack           ";CHR$134;e%(I%,7)
5590 PRINTCHR$131;"decay            ";CHR$134;e%(I%,8)
5600 PRINTCHR$131;"sustain          ";CHR$134;e%(I%,9)
5610 PRINTCHR$131;"release          ";CHR$134;e%(I%,1Ø)
5620 PRINTCHR$131;"attack level     ";CHR$134;e%(I%,11)
5630 PRINTCHR$131;"decay level      ";CHR$134;e%(I%,12);
5640 PRINTTAB(25,lastpar%+1)CHR$129;CHR$157;CHR$135;e%(I%,lastpar%);
5650 VDU28,Ø,19,39,17,31,X%,Y%
5660 ENDPROC
5670 :
5680 DEF PROCvaryenv(k%)
5690 LOCAL x%,y%,par%:par%=lastpar%
5700 X%=POS:Y%=VPOS:VDU28,Ø,24,39,2
5710 IF k%>229 x%=X%:y%=Y%:PROCenvmenu:VDU28,Ø,24,39,2:X%=x%:Y%=y%:PRINTTAB(1,Ø)ins$(I%):VDU23,1,1;Ø;Ø;Ø;:INPUTTAB(I%*4+1,18)""in$:VDU23,1,Ø;Ø;Ø;Ø;:IF in$<>"" ins$(I%)=LEFT$(in$,3):PRINTTAB(1,Ø)ins$(I%):GOTO 58ØØ ELSE IF k%>229 GOTO 58ØØ
5720 IF k%=136 e%(I%,par%)=e%(I%,par%)-1+9*INKEY(-1)
5730 IF k%=137 e%(I%,par%)=e%(I%,par%)+1-9*INKEY(-1)
5740 IF k%=138 par%=par%+1:IF par%>12 par%=Ø
5750 IF k%=139 par%=par%-1:IF par%<Ø par%=12
5760 PRINTTAB(25,lastpar%+1)"  ";CHR$135;
5770 PRINTTAB(25,par%+1)CHR$129;CHR$157;CHR$135;e%(I%,par%);"   "
5780 lastpar%=par%
5790 PROCenv
5800 VDU28,Ø,19,39,17,31,X%,Y%
5810 ENDPROC
5820 :
5830 DEF PROCrhythmmenu
5840 X%=POS:Y%=VPOS:VDU28,Ø,16,39,2
5850 CLS:PRINT'CHR$129;"Varying";CHR$135;rhythm$(R%);TAB(12,1)CHR$129;"Rhythm and";CHR$135;pat$(K%);TAB(27,1)CHR$129;"Drum"'
5860 PRINTCHR$134;"<[]>  ";CHR$131;"tempo";TAB(3Ø,3)CHR$129;tempo%*max%
5870 PRINTCHR$134;"<<>>  ";CHR$131;"beats per bar ";TAB(3Ø,4)CHR$129;max%
5880 PRINTCHR$134;"<,.>  ";CHR$131;"edit";CHR$134;"<DEL>";CHR$131;"Rhythm";CHR$134;"+<SH>";CHR$131;"Drum"
5890 PRINTCHR$134;"<Ø1234567>  ";CHR$131;"pitch number"
5900 PRINTCHR$134;"<@>    ";CHR$131;"accent on    ";CHR$134;"</>    ";CHR$131;"accent off"
5910 PRINTCHR$134;"<'HMLDRCTPWBN>";CHR$131;"drum hit accent on"
5920 PRINTCHR$134;"<'hmldrctpwbn>";CHR$131;"drum hit accent off"
5930 nt%=1:PRINTCHR$129;"V"
5940 PRINTTAB(Ø,11)CHR$13Ø;rseq$(R%)
5950 PROCprtacc
5960 PRINTTAB(Ø,13)CHR$131;seq$(K%)
5970 VDU28,Ø,19,39,17,31,X%,Y%
5980 ENDPROC
5990 :
6000 DEF PROCprtacc
6010 PRINTTAB(Ø,12)" ";
6020 FOR i%=1 TO LENracc$(R%)
6030 IF MID$(racc$(R%),i%,1)="1" PRINT"@"; ELSE PRINT"/";
6040 NEXT
6050 ENDPROC
6060 :
6070 DEF PROCvaryrhythm(v%)
6080 X%=POS:Y%=VPOS:VDU28,Ø,24,39,2
6090 v$=CHR$v%
6100 IF v%>219 AND v%<23Ø PRINTTAB(1,11)SPC(39)TAB(1,11)rseq$(R%)TAB(1,12)SPC(39)TAB(9,1)rhythm$(R%):PROCprtacc:VDU23,1,1;Ø;Ø;Ø;:INPUTTAB(R%*4+1,19)""in$:VDU23,1,Ø;Ø;Ø;Ø;:IF in$<>"" rhythm$(R%)=LEFT$(in$,3):PRINTTAB(9,1)rhythm$(R%)
6110 IF v%>2ØØ AND v%<21Ø PRINTTAB(1,13)SPC(39)TAB(1,13)seq$(K%)TAB(24,1)pat$(K%):VDU23,1,1;Ø;Ø;Ø;:INPUTTAB(K%*4+1,21)""in$:VDU23,1,Ø;Ø;Ø;Ø;:IF in$<>"" pat$(K%)=LEFT$(in$,3):PRINTTAB(24,1)pat$(K%)
6120 IF k%=136 OR k%=137 PROCtempo(k%)
6130 IF v%=6Ø AND max%>1 max%=max%-1:PRINTTAB(nt%,1Ø)" ":nt%=max%:PRINTTAB(nt%,1Ø)"V"
6140 IF v%=62 AND max%<32 max%=max%+1:PRINTTAB(nt%,1Ø)" ":nt%=max%:PRINTTAB(nt%,1Ø)"V"
6150 IF INSTR("Ø1234567",v$) AND nt%<LENrseq$(R%)+1 rseq$(R%)=LEFT$(rseq$(R%),nt%-1)+v$+RIGHT$(rseq$(R%),LENrseq$(R%)-nt%):PRINTTAB(nt%,11)v$
6160 IF v$="@" AND nt%<LENracc$(R%)+1 racc$(R%)=LEFT$(racc$(R%),nt%-1)+"1"+RIGHT$(racc$(R%),LENracc$(R%)-nt%):PRINTTAB(nt%,12)v$
6170 IF v$="/" AND nt%<LENracc$(R%)+1 racc$(R%)=LEFT$(racc$(R%),nt%-1)+"2"+RIGHT$(racc$(R%),LENracc$(R%)-nt%):PRINTTAB(nt%,12)v$
6180 IF INSTR("Ø1234567",v$) AND nt%=LENrseq$(R%)+1 rseq$(R%)=rseq$(R%)+v$:racc$(R%)=racc$(R%)+"2":PRINTTAB(nt%,11)v$:PRINTTAB(nt%,12)"/":max%=max%+1:v%=46
6190 IF v%=127 AND INKEY(-1)=Ø PRINTTAB(LENrseq$(R%),11)" "TAB(LENrseq$(R%),12)" ":rseq$(R%)=LEFT$(rseq$(R%),LENrseq$(R%)-1):max%=max%-1
6200 PRINTTAB(31,3);tempo%*max%;" "TAB(31,4);max%;" "
6210 IF INSTR("'hmldrctpwbnHMLDRCTPWBN",v$) AND nt%<LENseq$(K%)+1 seq$(K%)=LEFT$(seq$(K%),nt%-1)+v$+RIGHT$(seq$(K%),LENseq$(K%)-nt%):PRINTTAB(nt%,13)v$
6220 IF INSTR("'hmldrctpwbnHMLDRCTPWBN",v$) AND nt%=LENseq$(K%)+1 seq$(K%)=seq$(K%)+v$:PRINTTAB(nt%,13)v$:v%=46
```

Continued ▶

STRUM

◀ Continued

```
 623Ø IF v%=127 AND INKEY(-1) PRINTTAB(L
ENseq$(K%),13)" ":seq$(K%)=LEFT$(seq$(K%
),LENseq$(K%)-1)
 624Ø IF v%=46 AND nt%<32 PRINTTAB(nt%,1
Ø)" ":nt%=nt%+1:PRINTTAB(nt%,1Ø)"V"
 625Ø IF v%=44 AND nt%>1 PRINTTAB(nt%,1Ø
)" ":nt%=nt%-1:PRINTTAB(nt%,1Ø)"V"
 626Ø VDU28,Ø,19,39,17,31,X%,Y%
 627Ø ENDPROC
 628Ø :
```

LIFE

Listing 1

```
 1Ø REM LifeAss
 2Ø REM by Phil Bender
 3Ø REM for B/B+/M/C
 4Ø REM (C) BAU May 199Ø
 5Ø :
 6Ø MODE 7
 7Ø clo=&7Ø:chi=&71
 8Ø vlo=&72:vhi=&73
 9Ø tempa=&74:tempx=&75:tempy=&76
 1ØØ loy=&77:hiy=&78
 11Ø scrlo=&79:scrhi=&7A
 12Ø gen=&7B:delay=&7F:char=&8Ø
 13Ø col=&CØØ:row=&C8Ø
 14Ø cells=&2ØØØ:votes=&28ØØ
 15Ø osbyte=&FFF4:oswrch=&FFEE
 16Ø FOR opt=Ø TO 3 STEP 3
 17Ø P%=&9ØØ
 18Ø [OPT opt
 19Ø .zero
 2ØØ STA vhi
 21Ø LDX#8
 22Ø LDA#Ø
 23Ø STA vlo
 24Ø TAY
 25Ø .loop
 26Ø STA (vlo),Y
 27Ø INY
 28Ø BNE loop
 29Ø INC vhi
 3ØØ DEX
 31Ø BNE loop
 32Ø RTS
 33Ø :
 34Ø .life
 35Ø SEI
 36Ø LDA#cells DIV 256
 37Ø STA chi
 38Ø LDA#Ø
 39Ø STA clo
 4ØØ LDX#31
 41Ø .loop2
 42Ø LDY#63
 43Ø .loop3
 44Ø LDA(clo),Y
 45Ø BEQ next
 46Ø JMP vote
 47Ø .next
 48Ø DEY
 49Ø BPL loop3
 5ØØ LDA clo
 51Ø CLC
 52Ø ADC#64
 53Ø STA clo
 54Ø BCC done1
 55Ø INC chi
 56Ø .done1
 57Ø DEX
 58Ø BPL loop2
 59Ø :
 6ØØ .update
 61Ø LDA#votes DIV256
 62Ø STA vhi
 63Ø LDA#cells DIV256
 64Ø STA chi
 65Ø LDA#Ø
 66Ø STA vlo
 67Ø STA clo
 68Ø LDX#Ø
 69Ø .loop4
 7ØØ LDY#63
 71Ø .loop5
 72Ø LDA(vlo),Y
 73Ø BEQ nowt
 74Ø CMP#4
 75Ø BNE chk3
 76Ø LDA#Ø
 77Ø STA(vlo),Y
 78Ø BEQ nowt
 79Ø .chk3
 8ØØ CMP#3
 81Ø BNE dead
 82Ø LDA#Ø
 83Ø STA(vlo),Y
 84Ø LDA(clo),Y
 85Ø BNE nowt
 86Ø LDA#1
 87Ø JMP print
 88Ø .dead
 89Ø LDA#Ø
 9ØØ STA(vlo),Y
 91Ø LDA(clo),Y
 92Ø BEQ nowt
 93Ø LDA#Ø
 94Ø JMP print
 95Ø .nowt
 96Ø DEY
 97Ø BPL loop5
 98Ø INX
 99Ø LDA vlo
 1ØØØ CLC
 1Ø1Ø ADC#64
 1Ø2Ø STA vlo
 1Ø3Ø STA clo
 1Ø4Ø BCC loop4
 1Ø5Ø INC vhi
 1Ø6Ø INC chi
 1Ø7Ø CPX#32
 1Ø8Ø BNE loop4
 1Ø9Ø       \alldone
 11ØØ LDX#Ø
 111Ø .loop6
 112Ø INC gen,X
 113Ø LDA gen,X
 114Ø CMP#58
 115Ø BNE nocarry
 116Ø LDA#48
 117Ø STA gen,X
 118Ø INX
 119Ø CPX#4
 12ØØ BNE loop6
 121Ø .nocarry
 122Ø LDA#31
 123Ø JSR oswrch
 124Ø LDA#73
 125Ø JSR oswrch
 126Ø LDA#25
 127Ø JSR oswrch
 128Ø LDX#3
 129Ø .loop7
 13ØØ LDA gen,X
 131Ø JSR oswrch
 132Ø DEX
 133Ø BPL loop7
 134Ø LDA delay
 135Ø BEQ key1
 136Ø .loopA
 137Ø TAX
 138Ø .loopB
 139Ø LDY#Ø
 14ØØ .loopC
 141Ø INY
 142Ø BNE loopC
 143Ø DEX
 144Ø BNE loopB
 145Ø DEC delay
 146Ø BNE loopA
 147Ø STA delay
 148Ø .key1
 149Ø LDA#&81
 15ØØ LDX#&CF
 151Ø LDY#&FF
 152Ø JSR osbyte
 153Ø BCC key2
 154Ø LDA#24
 155Ø STA delay
 156Ø JMP life
 157Ø .key2
 158Ø LDA#&81
 159Ø LDX#&CE
 16ØØ LDY#&FF
 161Ø JSR osbyte
 162Ø BCC key3
 163Ø LDA#1Ø
 164Ø STA delay
 165Ø JMP life
 166Ø .key3
 167Ø LDA#&81
 168Ø LDX#&EE
 169Ø LDY#&FF
 17ØØ JSR osbyte
 171Ø BCC p
 172Ø LDA#Ø
 173Ø STA delay
 174Ø JMP life
 175Ø .p
 176Ø LDA#&81
 177Ø LDX#&C8
 178Ø LDY#&FF
 179Ø JSR osbyte
 18ØØ BCC q
 181Ø .o
 182Ø LDA#&81
 183Ø LDX#&C9
 184Ø LDY#&FF
 185Ø JSR osbyte
 186Ø BCC o
 187Ø .q
 188Ø LDA#&81
 189Ø LDX#&EF
 19ØØ LDY#&FF
 191Ø JSR osbyte
 192Ø BCS ret
 193Ø JMP life
 194Ø .ret
 195Ø CLI
 196Ø RTS
 197Ø :
 198Ø .vote
 199Ø STY tempy     \123
 2ØØØ LDA clo       \4*6
 2Ø1Ø STA vlo       \789
 2Ø2Ø LDA chi
 2Ø3Ø CLC
 2Ø4Ø ADC#8
 2Ø5Ø STA vhi
 2Ø6Ø LDA(vlo),Y
 2Ø7Ø ADC#1
 2Ø8Ø STA(vlo),Y   \5
 2Ø9Ø DEY
 21ØØ TYA
 211Ø AND#63
 212Ø TAY
 213Ø STY loy
 214Ø LDA(vlo),Y
 215Ø ADC#1
 216Ø STA(vlo),Y   \4
 217Ø INY
 218Ø INY
 219Ø TYA
 22ØØ AND#63
 221Ø TAY
 222Ø STY hiy
 223Ø LDA(vlo),Y
 224Ø ADC#1
 225Ø STA(vlo),Y   \6
 226Ø LDA vlo
 227Ø SEC
 228Ø SBC#64
 229Ø STA vlo
 23ØØ BCS here1
 231Ø DEC vhi
 232Ø LDA vhi
 233Ø CMP#&27
 234Ø BNE here1
 235Ø LDA #&2F
 236Ø STA vhi
 237Ø .here1
 238Ø LDA(vlo),Y
 239Ø CLC
 24ØØ ADC#1
 241Ø STA(vlo),Y   \3
 242Ø LDY tempy
 243Ø LDA(vlo),Y
 244Ø ADC#1
 245Ø STA(vlo),Y   \2
 246Ø LDY loy
 247Ø LDA(vlo),Y
 248Ø ADC#1
 249Ø STA(vlo),Y   \1
 25ØØ LDA vlo
 251Ø CLC
 252Ø ADC#128
 253Ø STA vlo
 254Ø BCC here2
 255Ø INC vhi
 256Ø LDA vhi
 257Ø CMP#&3Ø
 258Ø BNE here2
 259Ø LDA#&28
 26ØØ STA vhi
 261Ø .here2
 262Ø LDA(vlo),Y
 263Ø CLC
 264Ø ADC#1
 265Ø STA(vlo),Y   \7
 266Ø LDY hiy
 267Ø LDA(vlo),Y
 268Ø ADC#1
 269Ø STA(vlo),Y   \9
 27ØØ LDY tempy
 271Ø LDA(vlo),Y
 272Ø ADC#1
 273Ø STA(vlo),Y   \8
 274Ø JMP next
 275Ø :
 276Ø .print
 277Ø STY tempy
 278Ø STX tempx
 279Ø STA tempa
 28ØØ STA (clo),Y
 281Ø TYA
 282Ø ASL A
 283Ø TAY
 284Ø TXA
 285Ø ASL A
 286Ø TAX
 287Ø LDA row,X
 288Ø CLC
 289Ø ADC col,Y
 29ØØ STA scrlo
 291Ø LDA row+1,X
 292Ø ADC col+1,Y
 293Ø STA scrhi
 294Ø LDA tempa
 295Ø BEQ nul
 296Ø LDY#7
 297Ø .loop8
 298Ø LDA char,Y
 299Ø STA(scrlo),Y
 3ØØØ DEY
 3Ø1Ø BNE loop8
 3Ø2Ø BEQ fin
 3Ø3Ø .nul
 3Ø4Ø LDY#7
 3Ø5Ø .loop9
 3Ø6Ø STA(scrlo),Y
 3Ø7Ø DEY
 3Ø8Ø BNE loop9
 3Ø9Ø .fin
 31ØØ LDX tempx
 311Ø LDY tempy
 312Ø JMP nowt
 313Ø .end
 314Ø ]
 315Ø NEXT
 316Ø PROCcheck("zero","life",&C41)
 317Ø PROCcheck("life","update",&1ØB3)
 318Ø PROCcheck("update","vote",&7F8Ø)
 319Ø PROCcheck("vote","print",&3D6A)
 32ØØ PROCcheck("print","end",&1B75)
 321Ø *SAVE LIFCODE 9ØØ BØØ
 322Ø END
 323Ø DEFPROCcheck(start$,end$,sum%)
 324Ø T%=Ø
 325Ø FOR J%=EVAL start$ TO EVAL end$
 326Ø T%=T%+?J%
 327Ø NEXT
 328Ø IF T%<>sum% PRINT"Error - check co
de '";start$;"' to '";end$;"'":END
 329Ø ENDPROC
```

Listing 2

```
 1Ø REM Life
 2Ø REM by Phil Bender
 3Ø REM for B/B+/M/C/E
 4Ø REM (C) BAU May 199Ø
 5Ø :
 6Ø IF !&9ØØ<>&8A27385 THEN *LO. LIFCO
DE 9ØØ
 7Ø IF PAGE>&11ØØ PROCreloc
 8Ø *TVØ,1
 9Ø *FX4,1
 1ØØ MODE Ø
 11Ø VDU 23;82Ø2;Ø;Ø;Ø;
 12Ø HIMEM=&2ØØØ
 13Ø J%=RND(-TIME)
 14Ø gen%=&7B:delay%=&7F
 15Ø zero%=&9ØØ:life%=&914
 16Ø cells%=&2ØØØ:votes%=&28ØØ
 17Ø PROCtable
 18Ø ?delay%=1Ø
 19Ø F%=3:B%=4
 2ØØ VDU 19,Ø,B%;Ø;19,1,F%;Ø;
 21Ø REPEAT
 22Ø A%=cells% DIV 256:CALL zero%
 23Ø !gen%=&3Ø3Ø3Ø3Ø:REM ASC"ØØØØ"
 24Ø PROCedit
 25Ø A%=votes% DIV 256:CALL zero%
 26Ø CALL life%
 27Ø COLOUR Ø:COLOUR 129
 28Ø PRINTTAB(65,2Ø);" Again? (Y/N) "
 29Ø REPEAT K%=GET AND &DF
 3ØØ UNTIL K%=78 OR K%=89
 31Ø UNTIL K%=78
 32Ø *FX4
 33Ø END
 34Ø DEF PROCtable
 35Ø col%=&CØØ:row%=&C8Ø
 36Ø FOR J%=Ø TO 63
 37Ø !(col%+2*J%)=J%*8
 38Ø NEXT
 39Ø FOR J%=Ø TO 31
 4ØØ !(row%+2*J%)=&3ØØØ+J%*&28Ø
 41Ø NEXT
 42Ø FOR K%=Ø TO 1
 43Ø VDU 23,254+K%
 44Ø FOR J%=Ø TO 7
 45Ø READ D%:VDU D%
 46Ø ?(&78+J%+K%*8)=D%
 47Ø NEXT:NEXT
 48Ø RESTORE
 49Ø FOR K%=Ø TO 1
 5ØØ VDU 23,252+K%
 51Ø FOR J%=Ø TO 7
 52Ø READ D%:VDU(D% EOR &FF)
 53Ø NEXT:NEXT
 54Ø DATA Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø,24,6Ø,11Ø,7
8,11Ø,6Ø,24
 55Ø ENDPROC
```

Continued ▶

LIFE

◀ **Continued**

```
  56Ø DEF PROCedit
  57Ø VDU 17,128,12,28,64,31,79,Ø,17,129
,17,Ø,12
  58Ø PRINTTAB(5,2);"LIFE";TAB(5,4);"EDI
T";TAB(2,6);"KEYS:-"
  59Ø PRINTTAB(2,8);"Z,X,:,/ -";TAB(2,9)
;"move cursor"
  6ØØ PRINTTAB(2,11);"SPACE BAR -";TAB(2
,12);"set cell"
  61Ø PRINTTAB(2,14);"DELETE -";TAB(2,15
);"remove cell"
  62Ø PRINTTAB(2,17);"R - random"
  63Ø PRINTTAB(2,19);"F,B - change";TAB(
2,2Ø);"colours"
  64Ø PRINTTAB(2,22);"RETURN -";TAB(2,23
);"start"
  65Ø VDU 26,17,1,17,128
  66Ø X%=31:Y%=15
  67Ø PRINTTAB(X%,Y%);CHR$(FNpeek+252);
  68Ø REPEAT
  69Ø IF INKEY-1Ø1 B%=(B%+1) AND 7:VDU 1
9,Ø,B%;Ø;
  7ØØ IF INKEY-68 F%=(F%+1) AND 7:VDU 19
,1,F%;Ø;
  71Ø IF INKEY-98 PROCmove(63,Ø)
  72Ø IF INKEY-67 PROCmove(1,Ø)
  73Ø IF INKEY-73 PROCmove(Ø,31)
  74Ø IF INKEY-1Ø5 PROCmove(Ø,1)
  75Ø IF INKEY-99 PROCpoke(1)
  76Ø IF INKEY-9Ø PROCpoke(Ø)
  77Ø IF INKEY-52 REPEAT PROCmove(RND AN
D 63,RND AND 31):PROCpoke(1):UNTIL INKEY
-74
  78Ø Z%=INKEY 3Ø
  79Ø UNTIL INKEY-74
  8ØØ VDU 28,64,31,79,Ø,17,129,17,Ø,12
  81Ø PRINTTAB(5,2);"LIFE"
  82Ø PRINTTAB(2,5);"P - pause";TAB(2,7)
;"O - resume"
  83Ø PRINTTAB(2,9);"Q - quit";TAB(2,11)
;"1 - Slow"
  84Ø PRINTTAB(2,13);"2 - Medium";TAB(2,
15);"3 - Fast"
  85Ø VDU 26,17,1,17,128
  86Ø PRINTTAB(66,25);" Gen : ØØØØ "
  87Ø PRINTTAB(X%,Y%);CHR$(FNpeek+254);
  88Ø ENDPROC
  89Ø DEF PROCmove(dx%,dy%)
  9ØØ PRINTTAB(X%,Y%);CHR$(FNpeek+254);
  91Ø X%=(X%+dx%) AND 63
  92Ø Y%=(Y%+dy%) AND 31
  93Ø PRINTTAB(X%,Y%);CHR$(FNpeek+252);
  94Ø ENDPROC
  95Ø DEF FNpeek=?(cells%+X%+64*Y%)
  96Ø DEF PROCpoke(C%)
  97Ø ?(cells%+X%+64*Y%)=C%
  98Ø PROCmove(Ø,Ø)
  99Ø ENDPROC
 1ØØØ DEF PROCreloc
 1Ø1Ø IF PAGE>&19ØØ THEN *T.
 1Ø2Ø *K.ØF.X%=ØTO(TOP-PAGE)S.4:X%!&11ØØ
=X%!PA.:N.:PA.=&11ØØ|MO.|MRUN|M
 1Ø3Ø *FX138,Ø,128
 1Ø4Ø END
```

MATHS

Listing 1

```
   1Ø REM Multiprecision arithmetic
   2Ø REM for B/B+/M/C
   3Ø REM by DJ Cook
   4Ø REM (c) BAU May 199Ø
   5Ø :
   6Ø CLIV=!&Ø2Ø8 AND &FFFF
   7Ø START=&41ØØ
   8Ø IF PAGE<18432 THEN PRINT "ERROR: P
AGE MUST BE ALTERED":END
   9Ø FOR J=Ø TO 3 STEP 3
  1ØØ P%=START
  11Ø [
  12Ø OPT J
  13Ø LDA #Ø
  14Ø LDX #&1F
  15Ø .RØ:STA &7Ø,X
  16Ø DEX
  17Ø BPL RØ
  18Ø LDA #&19
  19Ø STA &71:\*** START NEW A REG ***
  2ØØ LDA #&29
  21Ø STA &75:\*** START NEW X REG ***
  22Ø LDA #&31
  23Ø STA &79:\*** START NEW SHIFT REG *
**
  24Ø LDA #&39
  25Ø STA &7D:\*** START NEW TEMP REG **
*
  26Ø LDA #(CMD MOD 256)
  27Ø STA &2Ø8
  28Ø LDA #(CMD DIV 256)
  29Ø STA &2Ø9
  3ØØ JSR SETA
  31Ø LDA #Ø
  32Ø LDY #Ø
  33Ø LDX #4Ø
  34Ø JMP R6
  35Ø .T2A:LDX #8
  36Ø LDY #Ø
  37Ø .R1:LDA (&8Ø),Y
  38Ø STA (&82),Y
  39Ø INY
  4ØØ BNE R1
  41Ø INC &81
  42Ø INC &83
  43Ø DEX
  44Ø BNE R1
  45Ø RTS
  46Ø \***** SET &8Ø TO X *****
  47Ø .XSET:LDA &74
  48Ø STA &8Ø
  49Ø LDA &75
  5ØØ STA &81
  51Ø RTS
  52Ø \***** SET &8Ø TO SHIFT *****
  53Ø .SSET:LDA &78
  54Ø STA &8Ø
  55Ø LDA &79
  56Ø STA &81
  57Ø RTS
  58Ø \***** SET &8Ø TO A *****
  59Ø .ASET:LDA &7Ø
  6ØØ STA &8Ø
  61Ø LDA &71
  62Ø STA &81
  63Ø RTS
  64Ø \***** SET &8Ø TO T *****
  65Ø .TSET:LDA &7C
  66Ø STA &8Ø
  67Ø LDA &7D
  68Ø STA &81
  69Ø RTS
  7ØØ \***** SET &82 TO X *****
  71Ø .SETX:LDA &74
  72Ø STA &82
  73Ø LDA &75
  74Ø STA &83
  75Ø RTS
  76Ø \***** SET &82 TO SHIFT *****
  77Ø .SETS:LDA &78
  78Ø STA &82
  79Ø LDA &79
  8ØØ STA &83
  81Ø RTS
  82Ø \***** SET &82 TO A *****
  83Ø .SETA:LDA &7Ø
  84Ø STA &82
  85Ø LDA &71
  86Ø STA &83
  87Ø RTS
  88Ø \***** SET &82 TO T *****
  89Ø .SETT:LDA &7C
  9ØØ STA &82
  91Ø LDA &7D
  92Ø STA &83
  93Ø RTS
  94Ø \***** TRANSFER  X TO A *****
  95Ø .TXA:LDA &76
  96Ø STA &72
  97Ø LDA &77
  98Ø STA &73
  99Ø JSR XSET
 1ØØØ JSR SETA
 1Ø1Ø JMP T2A
 1Ø2Ø \***** TRANSFER  A TO X *****
 1Ø3Ø .TAX:LDA &72
 1Ø4Ø STA &76
 1Ø5Ø LDA &73
 1Ø6Ø STA &77
 1Ø7Ø JSR ASET
 1Ø8Ø JSR SETX
 1Ø9Ø JMP T2A
 11ØØ \***** ADD &8Ø TO &82 *****
 111Ø .ADD:SED
 112Ø LDY #Ø
 113Ø CLC
 114Ø .R2:LDA (&8Ø),Y
 115Ø ADC (&82),Y
 116Ø STA (&82),Y
 117Ø INY
 118Ø BNE R2
 119Ø INC &81
 12ØØ INC &83
 121Ø DEX
 122Ø BNE R2
 123Ø .RR1:LDA #Ø
 124Ø ADC (&82),Y
 125Ø STA (&82),Y
 126Ø INY
 127Ø BNE BI
 128Ø INC &83
 129Ø .BI
 13ØØ BCS RR1
 131Ø CLD
 132Ø RTS
 133Ø \***** ADD X TO A *****
 134Ø .ADXA:JSR SETA
 135Ø JSR XSET
 136Ø LDX &77
 137Ø INX
 138Ø JSR ADD
 139Ø JMP RESETA
 14ØØ \***** RESET A *****
 141Ø .RESETA:LDA #&FF
 142Ø STA &8Ø
 143Ø LDA #&28
 144Ø STA &81
 145Ø LDY #Ø
 146Ø LDX #16
 147Ø JSR R3
 148Ø BCS RA
 149Ø LDA &8Ø
 15ØØ STA &72
 151Ø LDA &81
 152Ø SEC
 153Ø SBC &71
 154Ø STA &73
 155Ø RTS
 156Ø .RA:LDA #Ø
 157Ø STA &72
 158Ø STA &73
 159Ø RTS
 16ØØ \******* RESET REG ******
 161Ø .R3
 162Ø LDA #Ø
 163Ø CMP (&8Ø),Y
 164Ø BNE F1
 165Ø DEC &8Ø
 166Ø LDA #&FF
 167Ø CMP &8Ø
 168Ø BNE R3
 169Ø DEC &81
 17ØØ DEX
 171Ø BNE R3
 172Ø SEC
 173Ø RTS
 174Ø .F1:CLC
 175Ø RTS
 176Ø \***** SUBTRACT
 177Ø .SUBT:SED
 178Ø LDY #Ø
 179Ø LDX #8
 18ØØ SEC
 181Ø  .R4:LDA (&82),Y
 182Ø SBC (&8Ø),Y
 183Ø STA (&82),Y
 184Ø INY
 185Ø BNE R4
 186Ø INC &81
 187Ø INC &83
 188Ø DEX
 189Ø BNE R4
 19ØØ CLD
 191Ø RTS
 192Ø \***** SUBTRACT X FROM A *****
 193Ø .SUXA:JSR SATP
 194Ø JSR SXTP
 195Ø JSR COMPARE
 196Ø LDA &8D
 197Ø BPL F2
 198Ø JSR FAULT
 199Ø .F2:JSR XSET
 2ØØØ JSR SETA
 2Ø1Ø JSR SUBT
 2Ø2Ø JMP RESETA
 2Ø3Ø \***** COMPARE *****
 2Ø4Ø .COMPARE:LDY #&FF
 2Ø5Ø LDX #8
 2Ø6Ø  .R5:LDA (&8Ø),Y
 2Ø7Ø CMP (&82),Y
 2Ø8Ø BEQ F4
 2Ø9Ø BCC F5
 21ØØ LDA #&FF
 211Ø STA &8D
 212Ø RTS
 213Ø  .F5:LDA #1
 214Ø STA &8D
 215Ø RTS
 216Ø .F4:DEY
 217Ø CPY #&FF
 218Ø BNE R5
 219Ø DEC &81
 22ØØ DEC &83
 221Ø DEX
 222Ø BNE R5
 223Ø LDA #Ø
 224Ø STA &8D
 225Ø RTS
 226Ø \***** CLEAR A *****
 227Ø .CLA:LDA &7Ø
 228Ø STA &82
 229Ø LDA &71
 23ØØ STA &83
 231Ø LDA #Ø
 232Ø LDY #Ø
 233Ø LDX #16
 234Ø  .R6:STA (&82),Y
 235Ø INY
 236Ø BNE R6
 237Ø INC &83
 238Ø DEX
 239Ø BNE R6
 24ØØ RTS
 241Ø \***** INPUT FROM KEYBOARD *****
 242Ø .KBI:JSR CLA
 243Ø LDA #&FE
 244Ø STA &82
 245Ø LDA #&28
 246Ø STA &83
 247Ø LDA #&FF
 248Ø STA &28FF
 249Ø .GT:JSR &FFEØ
 25ØØ CMP #127
 251Ø BNE FA
 252Ø JSR &FFEE
 253Ø INC &82
 254Ø BNE DEL
 255Ø INC &83
 256Ø .DEL:LDA #Ø
 257Ø TAY
 258Ø STA (&82),Y
 259Ø LDA &8D
 26ØØ CMP &83
 261Ø BEQ KBI
 262Ø JMP GT
 263Ø .FA:CMP #13
 264Ø BEQ (CPCT)
 265Ø CMP #ASC("Ø")
 266Ø BCC GT
 267Ø CMP #ASC(":")
 268Ø BCS GT
 269Ø PHA
 27ØØ JSR &FFEE
 271Ø PLA
 272Ø AND #&F
 273Ø LDY #Ø
 274Ø STA (&82),Y
 275Ø DEC &82
 276Ø LDA &82
 277Ø CMP #&FF
 278Ø BNE GT
 279Ø DEC &83
 28ØØ LDY &71
 281Ø DEY
 282Ø CPY &83
 283Ø BNE GT
 284Ø JMP FAULT
 285Ø .CPCT
 286Ø JSR &FFEE
 287Ø LDA #1Ø
 288Ø JSR &FFEE
 289Ø INC &82
 29ØØ BNE B2
 291Ø INC &83
 292Ø .B2
 293Ø LDY #Ø
 294Ø LDA &71
 295Ø STY &8Ø
 296Ø STA &81
 297Ø .R7:LDA (&82),Y
 298Ø CMP #&FF
 299Ø BEQ F8
 3ØØØ STA &8D
 3Ø1Ø LDA #Ø
 3Ø2Ø STA (&82),Y
 3Ø3Ø INC &82
 3Ø4Ø BNE B3
 3Ø5Ø INC &83
 3Ø6Ø .B3
 3Ø7Ø LDA #&29
 3Ø8Ø CMP &83
 3Ø9Ø BEQ F9
 31ØØ LDA (&82),Y
 311Ø CMP #&FF
 312Ø BEQ F9
 313Ø ASL A
 314Ø ASL A
 315Ø ASL A
 316Ø ASL A
 317Ø ORA &8D
 318Ø STA (&8Ø),Y
 319Ø LDA #Ø
 32ØØ STA (&82),Y
 321Ø INC &82
 322Ø BNE B4
 323Ø INC &83
 324Ø .B4
 325Ø LDA &29
 326Ø CMP &83
 327Ø BEQ F8
 328Ø INC &8Ø
 329Ø BNE B5
 33ØØ INC &81
 331Ø .B5
 332Ø JMP R7
 333Ø .F9:LDA &8D
 334Ø STA (&8Ø),Y
 335Ø .F8:LDA #Ø:STA &28FF:JMP RESETA
 336Ø .FAULT:BRK:\ ****** ERROR *******
```

Continued ▶

MATHS

◀ Continued

```
3370 EQUB 5
3380 EQUS "MISTAKE IN MULTIPRECISION RO
UTINE"
3390 EQUB 0
3400 .STR:JSR CLA\*** STRING
3410 JSR TSET
3420 LDA #&FE
3430 STA &82
3440 LDA #&28
3450 STA &83
3460 LDA #&FF
3470 STA &28FF
3480 .SB1
3490 LDY #0
3500 LDA (&80),Y
3510 CMP #&0D
3520 BNE SB2
3530 JMP CPCT
3540 .SB2:CMP #ASC("0")
3550 BCC FAULT
3560 CMP #ASC(":")
3570 BCS FAULT
3580 AND #&F
3590 STA (&82),Y
3600 DEC &82
3610 LDA &82
3620 CMP #&FF
3630 BNE STR1
3640 DEC &83
3650 .STR1:INC &80
3660 BNE STR2
3670 INC &81
3680 .STR2:CLC
3690 BCC SB1
3700 :
3710 \*****SET X & A TOP ******
3720 .SATP:LDA &70
3730 CLC
3740 ADC #0
3750 STA &82
3760 LDA &71
3770 ADC #7
3780 STA &83
3790 RTS
3800 .SXTP:LDA &74
3810 CLC
3820 ADC #0
3830 STA &80
3840 LDA &75
3850 ADC #7
3860 STA &81
3870 RTS
3880 .SSTP:LDA &78
3890 CLC
3900 ADC #0
3910 STA &80
3920 LDA &79
3930 ADC #7
3940 STA &81
3950 RTS
3960 \***** COMPARE X & A *****
3970 .CXA
3980 JSR SATP
3990 JSR SXTP
4000 JMP COMPARE
4010 \***** MULTIPLY X*A *****
4020 .MXA
4030 JSR ASET
4040 JSR SETT
4050 JSR T2A
4060 LDA &72
4070 STA &7E
4080 LDA &73
4090 STA &7F
4100 JSR SATP
4110 JSR SXTP
4120 JSR CXA
4130 LDA &8D
4140 BMI J3
4150 JSR ASET
4160 JSR SHFTLFT
4170 JSR A285
4180 JSR X287
4190 JSR T5
4200 LDA &76
4210 STA &89
4220 LDA &77
4230 STA &8A
4240 JSR CLA
4250 JSR T1MES
4260 JMP RESETA
4270 .J3:JSR XSET
4280 JSR SHFTLFT
4290 JSR A285
4300 JSR T287
4310 JSR X5
4320 LDA &72
4330 STA &89
4340 LDA &73
4350 STA &8A
4360 JSR CLA
4370 JSR T1MES
4380 JMP RESETA
4390 .T5:LDA &7C
4400 STA &8B
4410 LDA &7D
4420 STA &8C
4430 RTS
4440 .A5:LDA &70
4450 STA &8B
4460 LDA &71
4470 STA &8C
4480 RTS
4490 .X5:LDA &74
4500 STA &8B
4510 LDA &75
4520 STA &8C
4530 RTS
4540 .A285:LDA &70
4550 STA &85
4560 LDA &71
4570 STA &86
4580 RTS
4590 .X287:LDX #3
4600 .RX2:LDA &74,X
4610 STA &87,X
4620 DEX
4630 BPL RX2
4640 RTS
4650 .T287:LDX #3
4660 .RT2:LDA &7C,X
4670 STA &87,X
4680 DEX
4690 BPL RT2
4700 RTS
4710 \***** &80 TO SHIFT *****
4720 .SHFTLFT:LDX #8
4730 LDY #0
4740 STY &8D
4750 LDA &78
4760 STA &82
4770 LDA &79
4780 STA &83
4790 .B1:LDA (&80),Y
4800 PHA
4810 ASL A
4820 ASL A
4830 ASL A
4840 ASL A
4850 ORA &8D
4860 STA (&82),Y
4870 PLA
4880 LSR A
4890 LSR A
4900 LSR A
4910 LSR A
4920 STA &8D
4930 INY
4940 BNE B1
4950 INC &81
4960 INC &83
4970 DEX
4980 BNE B1
4990 .SH3:LDA &78
5000 STA &8E
5010 LDA &79
5020 STA &8F
5030 RTS
5040 .T1MES:LDY #0
5050 LDA (&87),Y
5060 PHA
5070 AND #&F
5080 BEQ FT1
5090 STA &8D
5100 .TB1
5110 LDA &85
5120 STA &82
5130 LDA &86
5140 STA &83
5150 LDA &8B
5160 STA &80
5170 LDA &8C
5180 STA &81
5190 LDX &77
5200 INX
5210 INX
5220 JSR ADD
5230 DEC &8D
5240 BNE TB1
5250 .FT1:PLA
5260 LSR A
5270 LSR A
5280 LSR A
5290 LSR A
5300 AND #&F
5310 BEQ TE
5320 STA &8D
5330 .TB2
5340 LDA &85
5350 STA &82
5360 LDA &86
5370 STA &83
5380 LDA &8E
5390 STA &80
5400 LDA &8F
5410 STA &81
5420 LDX &77
5430 INX
5440 JSR ADD
5450 DEC &8D
5460 BNE TB2
5470 .TE
5480 INC &85
5490 BNE BT2
5500 INC &86
5510 .BT2
5520 INC &87
5530 BNE BT3
5540 INC &88
5550 .BT3:DEC &89
5560 LDA #&FF
5570 CMP &89
5580 BNE T1MES
5590 DEC &8A
5600 BPL T1MES
5610 RTS
5620 \***** CLEAR REG *****
5630 .CL2:LDY #0
5640 TYA
5650 LDX #8
5660 .CR1
5670 STA (&80),Y
5680 INY
5690 BNE CR1
5700 :
5710 INC &81
5720 DEX
5730 BNE CR1
5740 RTS
5750 .CLSHFT
5760 JSR SSET
5770 JMP CL2
5780 .CLX
5790 JSR XSET
5800 JMP CL2
5810 .CLT
5820 JSR TSET
5830 JMP CL2
5840 \****** DIVIDE A BY X *****
5850 .DXA
5860 JSR CLT
5870 JSR XSET
5880 JSR SHFTLFT
5890 SEC
5900 LDA &72
5910 SBC &76
5920 STA &F8
5930 LDA &73
5940 SBC &77
5950 BPL XD1
5960 JMP FAULT
5970 .XD1:STA &F9
5980 CLC
5990 LDA &70
6000 ADC &F8
6010 STA &70
6020 LDA &71
6030 ADC &F9
6040 STA &71
6050 CLC
6060 LDA &F8
6070 ADC &7C
6080 STA &8E
6090 LDA &F9
6100 ADC &7D
6110 STA &8F
6120 LDA #0
6130 STA &84
6140 .DR1:JSR SSTP
6150 JSR SATP
6160 JSR COMPARE
6170 LDA &8D
6180 BMI DF1
6190 JSR SSET
6200 JSR SETA
6210 JSR SUBT
6220 INC &84
6230 JMP DR1
6240 .DF1
6250 LDY #0
6260 LDA &84
6270 ASL A
6280 ASL A
6290 ASL A
6300 ASL A
6310 ORA (&8E),Y
6320 STA (&8E),Y
6330 STY &84
6340 .DR2:JSR SXTP
6350 JSR SATP
6360 JSR COMPARE
6370 LDA &8D
6380 BMI DF2
6390 JSR XSET
6400 JSR SETA
6410 JSR SUBT
6420 INC &84
6430 JMP DR2
6440 .DF2
6450 LDY #0
6460 LDA &84
6470 ORA (&8E),Y
6480 STA (&8E),Y
6490 STY &84
6500 DEC &70
6510 LDA &70
6520 CMP #&FF
6530 BNE DF3
6540 DEC &71
6550 LDA &71
6560 CMP #&18
6570 BNE DF3
6580 LDA #0
6590 STA &70
6600 LDX #&19
6610 STX &71
6620 JSR RESETA
6630 JSR ETA
6640 JMP RESETA
6650 .DF3
6660 DEC &8E
6670 LDA &8E
6680 CMP #&FF
6690 BNE DF4
6700 DEC &8F
6710 .DF4:JMP DR1
6720 \***** EXCHANGE A & T *****
6730 .ETA:JSR SETT
6740 JSR ASET
6750 JSR EXC
6760 LDA &7F
6770 LDX &73
6780 STA &73
6790 STX &7F
6800 LDA &7E
6810 LDX &72
6820 STA &72
6830 STX &7E
6840 RTS
6850 \***** EXCHANGE ****
6860 .EXC
6870 LDX #8
6880 LDY #0
6890 .ER1:LDA (&80),Y
6900 PHA
6910 LDA (&82),Y
6920 STA (&80),Y
6930 PLA
6940 STA (&82),Y
6950 INY
6960 BNE ER1
6970 INC &81
6980 INC &83
6990 DEX
7000 BNE ER1
7010 RTS
7020 \***** PRINT A REG *****
7030 .PRA
7040 LDY &72
7050 LDA #0
7060 STA &82
7070 LDA &73
7080 CLC
7090 ADC &71
7100 STA &83
7110 .LBL:LDA (&82),Y
7120 PHA
7130 AND #&F0
7140 LSR A
7150 LSR A
7160 LSR A
7170 LSR A
7180 CLC
7190 ADC #&30
7200 JSR &FFEE
7210 PLA
7220 AND #&F
7230 CLC
7240 ADC #&30
7250 JSR &FFEE
7260 DEY
7270 CPY #&FF
7280 BNE LBL
7290 DEC &83
7300 LDX #&19
7310 DEX
7320 CPX &83
7330 BNE LBL
7340 LDA #&D
7350 JSR &FFEE
7360 LDA #10
7370 JSR &FFEE
7380 RTS
7390 \***** EXCHANGE X & A *****
7400 .EXA:JSR SETX
7410 JSR ASET
7420 JSR EXC
7430 LDA &77
7440 LDX &73
7450 STA &73
7460 STX &77
7470 LDA &76
7480 LDX &72
7490 STA &72
7500 STX &76
7510 RTS
7520 \******* RESET X **********
7530 .RESETX
7540 LDA #&FF
7550 STA &80
7560 LDA #&30
7570 STA &81
7580 LDY #0
7590 LDX #16
7600 JSR R3
7610 BCS RX
7620 LDA &80
7630 STA &76
7640 LDA &81
7650 SEC
7660 SBC &75
7670 STA &77
7680 RTS
7690 .RX:LDA #0
7700 STA &76
7710 STA &77
7720 RTS
7730 .CMD
7740 STA &80
```

Continued ▶

MATHS

◀ Continued

```
7750 STX &81
7760 STY &82
7770 LDX #&FF
7780 .loop
7790 LDY #&FF
7800 .inner
7810 INY:INX
7820 LDA TABLE,X
7830 BEQ ZERO
7840 CMP (&81),Y
7850 BEQ inner
7860 .AGAIN
7870 INY:INX
7880 LDA TABLE,X
7890 BNE AGAIN
7900 INY:INX
7910 LDA TABLE,X
7920 CMP #&FF
7930 BEQ EXIT
7940 INY:INX
7950 JMP loop
7960 .EXIT
7970 LDA &80
7980 LDX &81
7990 LDY &82
8000 JMP CLIV
8010 .ZERO
8020 INY:INX
8030 LDA TABLE,X
8040 CMP #&FF
8050 BEQ EXIT
8060 STA &85
8070 INY:INX
8080 LDA TABLE,X
8090 STA &86
8100 JMP (&85)
8110 \****** DIVIDE A BY 100 *******
8120 .DAH:JSR ASET
8130 LDX #16
8140 LDY #0
8150 STY &7E
8160 STA &7F
8170 STA &7F
8180 STA &3900
8190 .DH1:LDY #1
8200 LDA (&80),Y
8210 DEY
8220 STA (&80),Y
8230 INC &80
8240 BNE DH1
8250 INC &81
8260 DEX
8270 BNE DH1
8280 LDA #0
8290 STA &28FF
8300 JMP RESETA
8310 \****** A TIMES 10 *********
8320 .ADT:JSR ASET
8330 JSR SHFTLFT
8340 JSR SSET
8350 JSR SETA
8360 JSR EXC
8370 JMP RESETA
8380 .TABLE
8390 EQUS "*ADD":EQUB 0:EQUB (ADXA MOD
256):EQUB (ADXA DIV 256)
8400 EQUS "*SUB":EQUB 0:EQUB (SUXA MOD
256):EQUB (SUXA DIV 256)
8410 EQUS "*MXA":EQUB 0:EQUB (MXA MOD 2
56):EQUB (MXA DIV 256)
8420 EQUS "*DXA":EQUB 0:EQUB (DXA MOD 2
56):EQUB (DXA DIV 256)
8430 EQUS "*TXA":EQUB 0:EQUB (TXA MOD 2
56):EQUB (TXA DIV 256)
8440 EQUS "*TAX":EQUB 0:EQUB (TAX MOD 2
56):EQUB (TAX DIV 256)
8450 EQUS "*KBI":EQUB 0:EQUB (KBI MOD 2
56):EQUB (KBI DIV 256)
8460 EQUS "*PRA":EQUB 0:EQUB (PRA MOD 2
56):EQUB (PRA DIV 256)
8470 EQUS "*EXA":EQUB 0:EQUB (EXA MOD 2
56):EQUB (EXA DIV 256)
8480 EQUS "*ETA":EQUB 0:EQUB (ETA MOD 2
56):EQUB (ETA DIV 256)
8490 EQUS "*CMP":EQUB 0:EQUB (CXA MOD 2
56):EQUB (CXA DIV 256)
8500 EQUS "*CLX":EQUB 0:EQUB (CLX MOD 2
56):EQUB (CLX DIV 256)
8510 EQUS "*CLA":EQUB 0:EQUB (CLA MOD 2
56):EQUB (CLA DIV 256)
8520 EQUS "*RSA":EQUB 0:EQUB (RESETA MO
D 256):EQUB (RESETA DIV 256)
8530 EQUS "*RSX":EQUB 0:EQUB (RESETX MO
D 256):EQUB (RESETX DIV 256)
8540 EQUS "*STR":EQUB 0:EQUB (STR MOD 2
56):EQUB (STR DIV 256)
8550 EQUS "*DAH":EQUB 0:EQUB (DAH MOD 2
56):EQUB (DAH DIV 256)
8560 EQUS "*MAT":EQUB 0:EQUB (ADT MOD 2
56):EQUB (ADT DIV 256)
8570 EQUB 0
8580 EQUB &FF
8590 ]
8600 NEXT
8610 CALL &4100
8620 END
```

Listing 2

```
10 REM Newton's formulae for SQR(2)
20 REM by DJ Cook
30 REM for B/B+/M/C
40 REM (c) BAU May 1990
50 :
60 FOR J=&3900 TO &40FF:?J=ASC "0":NE
XT
70 ?&3900=ASC "1"
80 ?&40FD=13
90 *STR
100 REM === SAVE FIRST APPROX OF ROOT
TO DISC
110 *SAVE "ROOT" 1900 28FF
120 *TAX
130 REM === INPUT NUMBER AND SAVE TO D
ISC
140 ?&3900=ASC"2"
150 *STR
160 *MXA
170 *SAVE "NUMBER" 1900 28FF
180  REM === INPUT 50 INTO A AND SAVE,
MULTIPLYING BY 50 AND THEN DIVIDING BY
100 IS QUICKER THAN DIVIDING BY 2.
190 *CLA
200 ?&1900=&50
210 *RSA
220 *SAVE "FIFTY" 1900 28FF
230 REM === CALCULATE SQR(2) ****
240 REPEAT
250 D=D+1:PRINT D
260 *CLA
270 *LOAD "ROOT"
280 REM === LOAD APPROX ROOT
290 *RSA
300 *TAX
310 *CLA
320 *LOAD "NUMBER"
330 REM === LOAD NUMBER
340 *RSA
350 *DXA
360 *ADD
370 *TAX
380 *CLA
390 *LOAD "FIFTY"
400 REM === LOAD 50 INTO A
410 *RSA
420 *MXA
430 *DAH
440 *PRA
450 *TAX
460 *CLA
470 *LOAD "ROOT"
480 REM === LOAD PREV APPROX
490 *RSA
500 *CMP
510 *TXA
520 *SAVE "ROOT" 1900 28FF
530 REM === SAVE NEW APPROX
540 UNTIL ?&8D=0
550 END
```

POTTERY

Listing 1

```
10 REM >BBCGoblet
20 REM by Rob Miller
30 REM for B/B+/M/C/E/A
40 REM (c) BAU May 1990
50 :
60 MODE 2
70 VDU 23;8202;0;0;0;
80 VDU 29,640;0;
90 PROCsetup
100 nshades=8
110 step=(360/(2*nshades))
120 :
130 PROCcylinder(70,220,80,220,2)
140 PROCcylinder(80,220,100,200,2)
150 PROCcylinder(100,200,150,20,2)
160 PROCcylinder(150,30,450,30,1)
170 :
180 FOR R=180 TO 90 STEP -10
190 ew1=SINRAD(R)*250:ew2=SINRAD(R+10)
*250
200 eh1=COSRAD(R)*250:eh2=COSRAD(R+10)
*250
210 PROCcylinder(eh1+700,ew1,eh2+700,e
w2,1)
220 NEXT R
230 :
240 PROCcylinder(700,250,900,225,1)
250 PROCcylinder(900,225,900,215,2)
260 :
270 END
280 :
290 DEF PROCcylinder(eh1,ew1,eh2,ew2,p
al)
300 :
310 FOR D = -90 TO (270-step) STEP ste
p
320 :
330 h1 = ew1/4:h2 = ew2/4
340 x1 = SINRAD(D)*ew1       : y1 = (CO
SRAD(D)*h1)+eh1
350 x2 = SINRAD(D+step)*ew1 : y2 = (CO
SRAD(D+step)*h1)+eh1
360 x3 = SINRAD(D)*ew2       : y3 = (CO
SRAD(D)*h2)+eh2
370 x4 = SINRAD(D+step)*ew2 : y4 = (CO
SRAD(D+step)*h2)+eh2
380 :
390 IF pal=2 AND D<90 THEN GCOL 0,7-co
l((D+90) DIV step) ELSE GCOL 0,col((D+90
) DIV step)
400 PROCquad(x1,y1,x2,y2,x3,y3,x4,y4)
410 NEXT D
420 :
430 ENDPROC
440 :
450 DEF PROCquad(x1,y1,x2,y2,x3,y3,x4,
y4)
460 MOVE x3,y3:MOVE x1,y1
470 PLOT 85,x4,y4
480 PLOT 85,x2,y2
490 ENDPROC
500 :
510 DEF PROCsetup
520 DIM col(15)
530 FOR I = 0 TO 7
540 READ col%
550 col(I) = col%
560 col(I+8) = col%
570 NEXT I
580 ENDPROC
590 :
600 DATA 0,4,1,5,2,6,3,7
```

Listing 2

```
10 REM >ArcBottle
20 REM by Rob Miller
30 REM for Arc only
40 REM (c) BAU MAY 1990
50 :
60 MODE 15
70 OFF
80 ORIGIN 640,0
90 nshades=12
100 step=360/(2*nshades)
110 :
120 PROCcylinder(35,100,40,120,0,1,0,1
)
130 PROCcylinder(40,120,400,120,0,1,0,
1)
140 PROCcylinder(400,120,450,110,0,1,0
,1)
150 PROCcylinder(450,110,500,100,0,1,0
,1)
160 PROCcylinder(500,100,650,40,0,1,0,
2)
170 PROCcylinder(650,40,760,40,0,1,0,1
)
180 PROCcylinder(760,40,770,50,0,1,0,1
)
190 PROCcylinder(770,50,780,50,0,1,0,1
)
200 PROCcylinder(780,50,790,40,0,1,0,2
)
210 END
220 :
230 DEF PROCcylinder(ey1,ew1,ey2,ew2,r
%,g%,b%,pal)
240 :
250 FOR D = -90 TO (270-step) STEP ste
p
260 :
270 red%   = ((((D+90) DIV 60) MOD 3)+
1)*r%
280 green% = ((((D+90) DIV 60) MOD 3)+
1)*g%
290 blue% =  ((((D+90) DIV 60) MOD 3)+
1)*b%
300 tint%  = ((D+90) DIV 15)*64
310 :
320 IF pal=2 AND D<90 THEN
330 red%   = (2-(((D+90) DIV 60) MOD 3
)+1)*r%
340 green% = (2-(((D+90) DIV 60) MOD 3
)+1)*g%
350 blue%  = (2-(((D+90) DIV 60) MOD 3
)+1)*b%
360 tint%  = 1472-((D+90) DIV 15)*64
370 ENDIF
380 :
390 colour%=(blue%<<4)+(green%<<2)+red
%
400 GCOL colour% TINT tint%
410 :
420 h1 = ew1/4:h2 = ew2/4
430 x1 = SINRAD(D)*ew1       : y1 = (CO
SRAD(D)*h1)+ey1
440 x2 = SINRAD(D+step)*ew1 : y2 = (CO
SRAD(D+step)*h1)+ey1
450 x3 = SINRAD(D)*ew2       : y3 = (CO
SRAD(D)*h2)+ey2
460 x4 = SINRAD(D+step)*ew2 : y4 = (CO
SRAD(D+step)*h2)+ey2
470 :
480 PROCquad(x1,y1,x2,y2,x3,y3,x4,y4)
490 NEXT D
500 :
510 ENDPROC
520 :
530 DEF PROCquad(x1,y1,x2,y2,x3,y3,x4,
y4)
540 MOVE x3,y3:MOVE x1,y1
550 PLOT 85,x4,y4
560 PLOT 85,x2,y2
570 ENDPROC
```

DISCS

Listing 1

```
10 REM >CopyDFS
20 REM By David Lawrence
30 REM For Archimedes only
40 REM (C) BAU 1990
50 :
60 ON ERROR PROCerror:GOTO 90
70 MODE 12:OFF
80 PROCinit
90 REPEAT
100   prefix$ = FNvariables
110   PROCsetparams
120   PROCcopydisc(prefix$)
130 UNTIL FALSE
140 END
150 :
160 DEF PROCinit
170 Single = 0
180 Double = 1
190 One    = 0
200 Two    = 1
210 Multi  = 2
220 Both   = 2
230 Dest   = 6
240 delete = 6
250 cdir   = 8
260 error = FALSE
270 old = 0
280 new = 0
290 READ vars,defs
300 DIM var$(vars),opts(vars),pos(vars
),opts$(vars,4),defs(defs,vars)
310 FOR var = 0 TO vars - 1
320   READ var$(var),opts(var)
330   FOR opt = 0 TO opts(var)-1
340     READ opts$(var,opt)
350   NEXT
360   PROCdo(var,0)
370 NEXT
380 set$ = ""
390 FOR def = 0 TO defs - 1
400   READ let$
410   set$ += let$
420   FOR var = 0 TO vars - 1
430     READ defs(def,var)
440   NEXT
450 NEXT
460 free = HIMEM - END - &8000
470 DIM block 64,cat &200,space free
480 *FX 4 1
490 COLOUR 14,&60,&60,&60
500 PROCbox(15,15,64,1)
510 PROCset(1)
```

Continued ▶

DISCS

◀ Continued

```
520 ENDPROC
530 :
540 DEF PROCset(num)
550 FOR var = 0 TO vars -1
560   pos(var) = defs(num,var)
570   PROCdo(var,0)
580 NEXT
590 do = TRUE
600 ENDPROC
610 :
620 DEF PROCerror
630 IF REPORT$ = "Escape" THEN
640   IF INKEY-1 THEN
650     MODE 12
660   ELSE
670     ENDPROC
680   ENDIF
690 ELSE
700   MODE 12
710   PRINTCHR$13;REPORT$;" (";ERR;") at line ";ERL
720 ENDIF
730 END
740 :
750 DEF FNnaughty(err$)
760 PROCbox(38-LENerr$/2,20,42+LENerr$/2,18)
770 COLOUR 128:COLOUR 1
780 PRINTTAB(40-LENerr$/2,19);err$;
790 VDU 7
800 error = TRUE
810 = FALSE
820 :
830 DEF PROCwipe
840 VDU 17,128,28,0,31,79,17,12,26
850 error = FALSE
860 ENDPROC
870 :
880 DEF PROCdo(line,col)
890 COLOUR 6
900 COLOUR 128+col
910 PRINTTAB(18,line*2+2);" ";var$(line);" ";TAB(37,line*2+2);
920 COLOUR 128
930 FOR opt = 0 TO opts(line)-1
940   COLOUR 128
950   IF opt = pos(line) THEN
960     COLOUR 7
970     IF col = 1 COLOUR 129
980   ELSE
990     COLOUR 14
1000   ENDIF
1010   PRINT"  ";RIGHT$(opts$(line,opt),20);"  ";
1020   IF line = Dest THEN
1030     len = 20 - LEN(opts$(line,opt))
1040     IF len < 0 len = 0
1050     PRINTSPClen;STRING$(len+2,CHR$8);
1060   ENDIF
1070 NEXT
1080 ENDPROC
1090 :
1100 DEF PROCbox(x1,y2,x2,y1)
1110 MOVE x1*16-8,(31-y2)*32-8
1120 DRAW (x2+1)*16+4,(31-y2)*32-8
1130 DRAW (x2+1)*16+4,(32-y1)*32+4
1140 DRAW x1*16-8,(32-y1)*32+4
1150 DRAW x1*16-8,(31-y2)*32-8
1160 DRAW x1*16-24,(31-y2)*32-24
1170 DRAW (x2+1)*16+20,(31-y2)*32-24
1180 PLOT 1,-16,16:PLOT 0,16,-16
1190 DRAW (x2+1)*16+20,(32-y1)*32+20
1200 PLOT 1,-16,-16:PLOT 0,16,16
1210 DRAW x1*16-24,(32-y1)*32+20
1220 PLOT 1,16,-16:PLOT 0,-16,16
1230 DRAW x1*16-24,(31-y2)*32-24
1240 ENDPROC
1250 :
1260 DEF FNvariables
1270 done = FALSE
1280 PROCwipe
1290 REPEAT
1300   REPEAT
1310     IF old <> new PROCdo(old,0)
1320     PROCdo(new,1)
1330     IF new = Dest ON ELSE OFF
1340     old = new
1350     do = FALSE
1360     REPEAT
1370       key = GET
1380       OFF
1390       IF error PROCwipe
1400       IF new = Dest THEN
1410         PROCtext(opts$(Dest,0),key) : do = TRUE
1420       ELSE
1430         set = INSTR(set$,CHR$key)
1440         IF set > 0 THEN
1450           PROCset((set - 1) DIV 2)
1460           do = TRUE
1470         ENDIF
1480       ENDIF
1490       CASE key OF
1500         WHEN 136 : PROCadd(new,-1)
1510         WHEN 137 : PROCadd(new,1)
1520         WHEN 138 : new = (new + 1) MOD vars
1530         WHEN 139 : new = (new + vars - 1) MOD vars
1540         WHEN 13  : done = TRUE
1550       ENDCASE
1560     UNTIL new <> old OR done OR do
1570   UNTIL done
1580   path$ = opts$(Dest,0)
1590   IF pos(0) = 1 THEN
1600     SYS "XOS_File",5,path$ TO type ; flag
1610     CASE type OF
1620       WHEN 0 : done = FNcreate(path$ + ".")
1630       WHEN 1 : done = FNnaughty("Not a directory")
1640     ENDCASE
1650     IF (flag AND 1) done = FNnaughty("Bad directory name")
1660     IF done = FALSE new = Dest
1670   ENDIF
1680 UNTIL done
1690 PROCdo(old,0)
1700 OFF
1710 = path$ + "."
1720 :
1730 DEF PROCadd(line,val)
1740 pos(line) = (pos(line) + opts(line) + val) MOD opts(line)
1750 PROCdo(line,1)
1760 ENDPROC
1770 :
1780 DEF PROCtext(RETURN a$,key)
1790 IF key = 127 THEN
1800   IF LENa$ > 0 a$ = LEFT$(a$)
1810 ELSE
1820  IF key > 31 AND key < 127 a$ += CHR$key
1830 ENDIF
1840 ENDPROC
1850 :
1860 DEF FNcreate(dir$)
1870 IFFNnaughty("Create Sub-directories?")
1880 ON
1890 yes = FNyorn
1900 OFF
1910 PROCwipe
1920 IF yes THEN
1930   sub = 0
1940   REPEAT
1950    sub = INSTR(dir$,".",sub + 1)
1960    IF sub <> 0 THEN
1970      sub$ = LEFT$(dir$,sub - 1)
1980      SYS "OS_File",5,sub$ TO type
1990      IF type = 0 THEN
2000        SYS "OS_File",cdir,sub$
2010      ENDIF
2020    ENDIF
2030   UNTIL sub = 0
2040   = TRUE
2050 ENDIF
2060 = FALSE
2070 :
2080 DEF FNyorn
2090 REPEAT
2100   yorn = INSTR("YyNn",GET$)
2110 UNTIL yorn <> 0
2120 = (yorn < 3)
2130 :
2140 DEF PROCsetparams
2150 Copy    = (pos(0) = 1)
2160 Drive   = FNval(1)
2170 Density = pos(2)
2180 Tracks  = FNval(3)
2190 Catalog = pos(4)
2200 Side    = pos(5)
2210 Bytes   = 256
2220 IF Density = Single THEN
2230   Sectors = 10
2240   Record  = FNsetblock(Bytes,Sectors,Tracks)
2250 ELSE
2260   Sectors = 16
2270   Record  = 0
2280 ENDIF
2290 ENDPROC
2300 :
2310 DEF FNval(n)
2320 = VAL(opts$(n,pos(n)))
2330 :
2340 DEF PROCcopydisc(root$)
2350 FOR side = 0 TO 1
2360   IF Side = side OR Side = 2 THEN
2370     ptr = 0
2380     PROCreadcat
2390     PROCshowcat
2400     IF Copy THEN
2410       PROCcopycat(root$)
2420     ELSE
2430       VDU 7
2440       IF GET
2450     ENDIF
2460   ENDIF
2470 NEXT
2480 ENDPROC
2490 :
2500 DEF PROCreadcat
2510 track = 0
2520 sector = 0
2530 files = 0
2540 REPEAT
2550   PROCread(side,track,sector,&200,cat,Record)
2560   IF track = 0 AND sector = 0 THEN
2570     cycle =  cat?&104
2580     opt   = (cat?&106 DIV 16)
2590     size  = (cat?&106 AND &F)*256+(cat?&107)
2600   ENDIF
2610   num  =  cat?&105 DIV 8
2620   FOR file = 1 TO num
2630     file$ = ""
2640     FOR off = 0 TO 7
2650       char = cat?(file*8+off)
2660       char$ = CHR$(char AND &7F)
2670       CASE char$ OF
2680         WHEN " " : char$ = ""
2690         WHEN "." : char$ = "_"
2700         WHEN "&" : char$ = "+"
2710         WHEN "*","#","@","\","^","%","""" : char$ = "?"
2720       ENDCASE
2730       file$ += char$
2740     NEXT
2750     file$ = RIGHT$(file$) + "." + LEFT$(file$)
2760     IF file$ <> "?.???????" AND ASC(file$) <> 127 THEN
2770       load% = FNtwo(&100)
2780       exec% = FNtwo(&102)
2790       size% = FNtwo(&104)
2800       addr% = FNtwo(&106)
2810       addr% = (addr% AND &FF)<<8 OR (addr% AND &FF00)>>8
2820       IF addr% AND (1<<15) load% = load% OR &FFFF0000
2830       IF addr% AND (1<<14) exec% = exec% OR &FFFF0000
2840       PROCstore(file$,load%,exec%,size%,addr% AND &3FFF)
2850       files += 1
2860     ENDIF
2870   NEXT
2880   CASE Catalog OF
2890     WHEN One:
2900       next = 0
2910     WHEN Two:
2920       IF track = 0 AND sector = 0 THEN
2930         next = 2
2940       ELSE
2950         next = 0
2960       ENDIF
2970     WHEN Multi :
2980       next = (cat?&102 AND &F)*256 + (cat?&103)
2990   ENDCASE
3000   IF next <> 0 THEN
3010     track  = next DIV Sectors
3020     sector = next MOD Sectors
3030   ENDIF
3040 UNTIL next = 0
3050 ENDPROC
3060 :
3070 DEF FNtwo(off%)
3080 = cat?(file*8+off%) + 256 * cat?(file*8+off%+1)
3090 :
3100 DEF PROCstore(f$,l%,e%,s%,a%)
3110 IF ptr > free ERROR 0,"Out of memory"
3120 mem = space + ptr
3130 $mem = f$
3140 mem!10 = l%
3150 mem!14 = e%
3160 mem!18 = s%
3170 mem!22 = a%
3180 ptr += 26
3190 ENDPROC
3200 :
3210 DEF PROCget(n%,RETURN f$,RETURN l%,RETURN e%,RETURN s%,RETURN a%)
3220 mem = space + n% * 26
3230 f$ = $mem
3240 l% = mem!10
3250 e% = mem!14
3260 s% = mem!18
3270 a% = mem!22
3280 ENDPROC
3290 :
3300 DEF PROCshowcat
3310 PROCwipe
3320 COLOUR 7
3330 COLOUR 129
3340 PRINTTAB(28,17);" Side : ";side;"  Files : ";files;" "
3350 COLOUR 128
3360 FOR file = 0 TO files - 1
3370 PROCget(file,file$,x%,x%,x%,x%)
3380 PROCname(file,file$,7)
3390 NEXT
3400 ENDPROC
3410 :
3420 DEF PROCname(num,txt$,col)
3430 COLOUR col
3440 IF num < 104 PRINT TAB(10*(num MOD 8),18+(num DIV 8));txt$
3450 ENDPROC
3460 :
3470 DEF PROCcopycat(dir$)
3480 buffer = space + ptr
3490 IF Side = Both THEN
3500   dir$ += "Side" + STR$side + "."
3510   SYS "OS_File",cdir,LEFT$(dir$)
3520 ENDIF
3530 last$ = ""
3540 file = 0
3550 REPEAT
3560   REPEAT
3570     ok = TRUE
3580     PROCget(file,file$,load%,exec%,size%,addr%)
3590     IF ptr + size% > free ERROR 0,"Out of memory"
3600     track = addr% DIV Sectors
3610     sector = addr% MOD Sectors
3620     PROCname(file,file$,2)
3630     PROCread(side,track,sector,size%,buffer,Record)
3640     PROCname(file,file$,1)
3650     dfsdir$ = LEFT$(file$,1)
3660     IF dfsdir$ = "$" THEN
3670       save$ = MID$(file$,3)
3680     ELSE
3690       SYS "XOS_File",cdir,dir$ + dfsdir$ TO ; flag
3700       IF (flag AND 1) THEN
3710         PROCmore
3720         ok = FALSE
3730       ELSE
3740         save$ = file$
3750       ENDIF
3760     ENDIF
3770   UNTIL ok
3780   SYS "XOS_File",0,dir$ + save$,load%,exec%,buffer,buffer+size% TO ; flag
3790   IF (flag AND 1) THEN
3800     PROCmore
3810   ELSE
3820     PROCname(file,file$,7)
3830     file += 1
3840     last$ = dir$ + save$
3850   ENDIF
3860 UNTIL file = files
3870 ENDPROC
3880 :
3890 DEF PROCmore
3900 IF last$ = "" THEN
3910   ERROR 0,"Directory full"
3920 ELSE
3930   PROCname(file,file$,6)
3940   SYS "OS_File",delete,last$
3950   dir$ += "!!More."
3960   SYS "OS_File",cdir,LEFT$(dir$)
3970   file -= 1
3980 ENDIF
3990 ENDPROC
4000 :
4010 DEF FNsetblock(bytes%,sectors%,tracks%)
4020 FOR I% = 0 TO 63
4030 I%?block = 0
4040 NEXT
4050 block?0 = LOG(bytes%) / LOG(2)
4060 block?1 = sectors%
4070 block?2 = 1
4080 block?3 = 1
4090 block!16 = bytes% * sectors% * tracks% * 2
4100 = block
4110 :
4120 DEF PROCread(side%,track%,sector%,num%,addr%,block%)
4130 disc% = Bytes * (sector% + track%*Sectors + side%*Sectors*Tracks)
4140 SYS "ADFS_DiscOp",,((block% DIV 4)<<8) OR 1,disc% OR (Drive<<29),addr%,num%
4150 ENDPROC
4160 :
4170 DATA 7,3
4180 :
4190 DATA Operation,   2 , Catalog,Copy
4200 DATA DFS Drive,   4 , 0,1,2,3
4210 DATA Density,     2 , Single,Double
4220 DATA Tracks,      2 , 40,80
4230 DATA Catalog,     3 , One,Two,Multi
4240 DATA Side,        3 , 0,1,Both
4250 DATA Destination, 1 , adfs::4.$.Temp
4260 :
4270 DATA Aa, 1,1,0,1,0,2,0 : REM Acorn
4280 DATA Ss, 1,1,1,1,2,2,0 : REM Solidisk
4290 DATA Ww, 1,1,0,1,1,2,0 : REM Watford?
```

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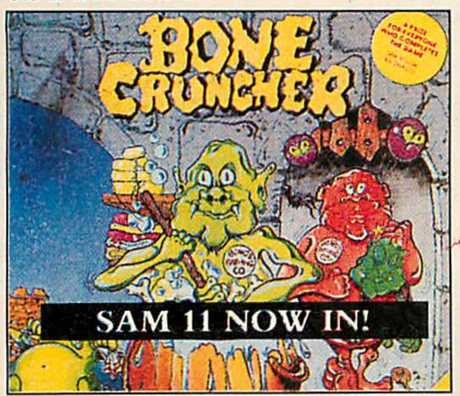
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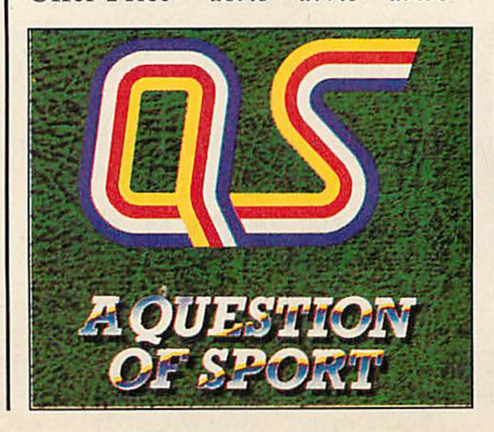
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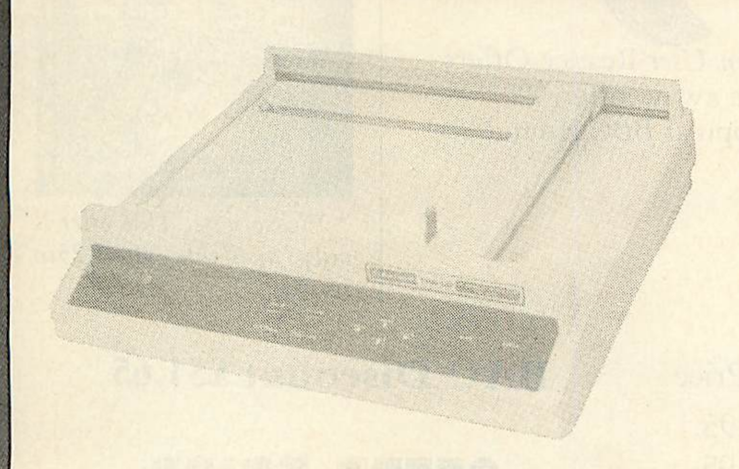
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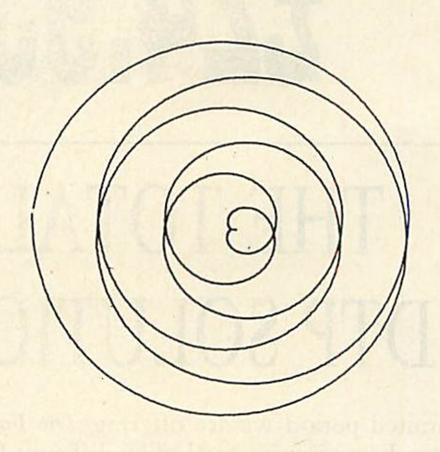
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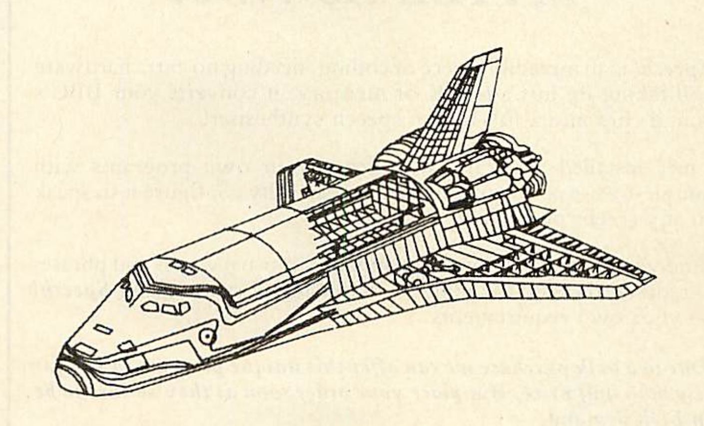


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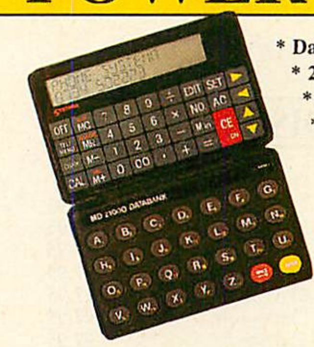
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If you can't make up a bridge foursome, try the Dual Screen Bridge Computer

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The go-anywhere Pocket Chess Plus Computer

This is a truly pocket sized chess computer featuring a touch sensitive board so you can forget about entering fiddly coordinates because the Pocket Plus knows where you move each piece.

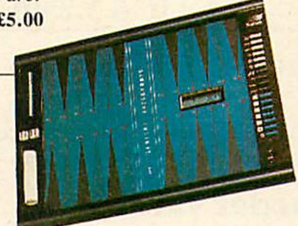
It comes with a comprehensive coaching facility which teaches tactical manoeuvres, warns you if a piece is in danger and even shows you its thinking.

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Save £15 on the Saitek Sensory Backgammon Computer

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EASY TO IMPRESS

Whether it's adventurous desktop publishing or simple wordprocessing, GRAHAM BELL says the latest from Computer Concepts can do the job easily

The program has been in the works for two years, on sale for six months, and has been acclaimed by the experts of two other Acorn magazines. So it might not seem like 'you read it here first'. But the real, 'finished' version of Computer Concepts' *Impression* DTP package was completed on 18 January this year – months after the so-called 'reviews'.

These reviews were based on incomplete prototype versions of the program and they both praised many 'features' which simply did not exist at that time!

Impression is written in Arm code, not Basic or C like most other applications. This makes it more difficult to write and debug, but has two benefits – it's faster, but more importantly the code is small (about half the size of Acorn *Desktop Publisher*). This means that unlike *ADP*, it can run comfortably and multi-task with small utilities on a 1Mb machine.

This fact alone could save you the need to add extra memory to your machine (though there's no denying it is useful).

Opening the stylish package reveals two novelties – a dongle, a book on the finer points of DTP – plus a well-written manual and the four floppy discs.

The dongle is a necessary evil: it's a tiny box that plugs into the printer port at the back of the Arc. You soon forget all about it – until you try to run *Impression* on another machine.

As an anti-piracy device, this is preferable to disc protection, as it neither stops you installing *Impression* on your hard disc (or indeed any other kind of disc), nor interferes with normal use of the machine (there's another socket on the dongle for the normal printer lead).

The book, *DTP at a Glance*, is as apt an introduction to the basics of typesetting and design for print as you could wish for. It's available separately, from Bookmark Publishing, and would be a worthwhile read for owners of *ADP* as well.

Impression's own manual is well above the average: I could spot only a couple of inconsistencies between the manual and the finished program, and the tutorial section is nicely paced. The unprotected discs hold *Impression* itself, a selection of scanned sprites and *!Draw* files, some example documents and tutorial material, and a copy of Acorn's outline font 'starter set'.

Included with this are the Trinity (Times), Homerton (Helvetica) and Corpus (Courier) typefaces which Acorn normally sells for £50, plus Computer Concepts' own Greek font that could be useful for technical work. The fonts will enhance other programs like *!Draw* that display or print using the fancy font system.

Installation

Impression is a 'frame-based desktop publishing' package. That means that you can create pages of a book, magazine, leaflet, or whatever. Anything that you want to put on a page has to go in a box, or frame. And frames can contain text, sprites (from a scanner, *!Paint* or a screen art package like *Artisan* or *Art Nouveau*) or drawings (from *!Draw*, *Presenter* or whatever).

For sprites and drawings, the size of the box controls the size of the illustration on the finished page; for text it controls the size of the column of type.

Impression starts up in the usual Risc OS way, installing its 'quill' icon. Clicking on it produces a window looking at a blank page. A five-item main menu gives access to the main features of the system.

The brevity of the menu belies *Impression*'s flexibility, as many of the menu options change according to what you are doing. So does the cursor – outside a frame it changes to a hand which can be used for scrolling around the page, whereas inside a frame there's an I-shaped text editing cursor that automatically disappears as you begin to type. For adjusting frames, there's a snowflake-shaped cursor.

One problem is that the snowflake and I cursors are quite chunky, partially obscuring what you are trying to alter.

The screen can show the *Impression* page at any magnification from x10 to 1 percent size, and whatever the scale, text is shown smoothly and quickly. You can simply start typing, or load some text in by selecting the frame then dragging in a text file icon from disc or direct from *!Edit*. As the text is read in, it assumes a style called 'basestyle', the default typeface, size, line spacing and so on. And you don't need to flow the text onto each page manually as you do with *ADP*: it flows automatically onto succeeding pages, which is a great time-saver.

You can flow in many separate text files, and each 'story' flows separately through its own series of frames. Additionally, a document can be split into chapters, each having within it one or more stories.

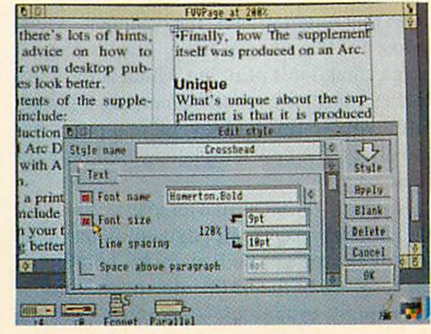
Documents are stored on disc as whole application directories, not simple files. For long documents this is a boon, as the directory contains a file for each chapter. If you run short of memory then chapters you aren't working on can be saved to disc automatically, so in practice, there's no limit to the size of document you can create.

But renaming a document is complicated because if you change the name, the directory acquires the wrong icon, not the *Impression* file icon. And you must not rename a document you're working on.

Associated with each document is a master page – in fact there's one for each chapter. These control the layout of any new pages that are created, so you can put on the master anything that should appear on all the pages: frames for columns of text, graphic frames for logos and the like, even running headers and footers.

The master page can also include any number of guide frames – helpful for positioning things on the real pages. This is considerably more flexible than *ADP*'s system of column guides.





Styling

The styling system is one of the features of *Impression* that contrasts with *ADP*. The basestyle defines the features of all the text in a document, and any further styles you apply to a section of text merely modify this basestyle.

New styles can alter one or more attributes of the text – the typeface used or the size, perhaps – but any attributes that are not specifically set by the new style are 'inherited' from the underlying basestyle.

So the final look of a section of text can be controlled by numerous, layered styles. In the example below, the section of underlined text inherits its other features from the underlying italic and basestyles.

The range of attributes that can be set is somewhat wider than *ADP*. Font size can be set to 1/16th point, and leading to a thousandth of a point. You can set space above and below paragraphs, text colour, underlined, strikethrough, sub- or superscript, and the font aspect ratio (condensed or expanded). In addition, you can kern letter pairs very precisely, so *Impression*'s typographic control is quite professional – certainly better than that of *ADP*.

The only real deficiency is a lack of control over the degree of wordspacing and letterspacing used to justify the text. With some work in setting up the styles you want, this can be a very powerful system. There are even styles that allow you to compile an index or contents table automatically.

But there is a problem with this system: *Impression* doesn't have quite the interactivity of the best DTP packages – there can be no 'increase size by one point' button. You can't arbitrarily change something without setting up a style for it.

You can, however, add new styles at any time, through a complex dialogue box. Editing the styles and creating new ones is easy once you've understood the layering principle: you only need specify the attributes you want to change.

This and other dialogues used by *Impression* all have a '3D look', not the usual spartan Risc OS standard.

There are a number of styles built-in by default – too many in my view. These are defined in a blank document which is loaded automatically when you start up *Impression*, so you can redefine them if you wish.

There are three other start-up files which provide a great way of creating quick documents on Epson LX, LQ and HP Deskjet or Laserjet printers. These provide a quick

The *quick* *brown fox* **jumped**

underline
italic
bold
basestyle

'character mode' that uses the built-in characters of your printer rather than the much slower outline fonts.

You can still use simple styles like underline, bold and condensed to highlight your text, and the overall effect is similar to a wordprocessor like *View* or *Interword*.

Wordprocessing

One of the things that marks *Impression* out from *ADP* is its ability to act as a very good wordprocessor.

When typing text into a frame the display is commendably quick. Typing continues seamlessly across frame and page boundaries, and new pages are created as you need them.

The text reformats in the background, and there's less of a wait while the rest of the page redraws than there is with *ADP*.

Impression has a host of key short-cuts, like CTRL-S for swap case or CTRL-A for delete, but these are not shown on the menus.

Search and replace are good and flexible, as you can include wildcards and even search for and replace styles or words which contain styles.

Impression can load files from *Interword*, *First Word Plus* and even Basic programs, or save text to *!Edit* when necessary. And it's good to be able to transfer text between two *Impression* documents by cutting from one and pasting to another – you can work with both on screen, as *Impression* can keep track of up to 16 separate documents at once, or of more than one view of the same document.

One deficiency is that there's no provision for counting the number of words in a section of text – information is available only for whole stories.

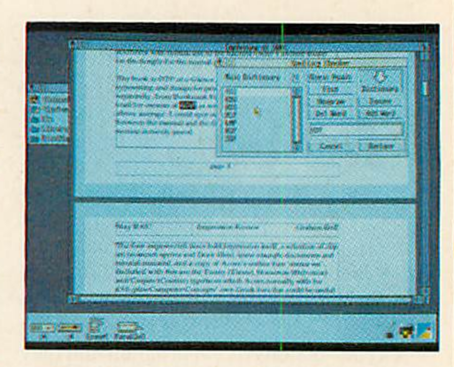
Given all of this, is *Impression* a DTP package or is it a wordprocessor? In most ways, it can be looked on as both.

The PC and Mac trend is for the chasm between wordprocessors and DTP to narrow, with wordprocessors acquiring multi-column abilities and better font control, and more convenient text editing being added to desktop publishers.

Impression follows this trend: although it is frame-based, and therefore DTP-like, it can be used as a minimum-fuss wordprocessor.

There is one surprise feature of *Impression* that might suggest the designer's view. Most DTP packages have 'master pages', pages that don't print but which act as templates for all the others. Changing a master after you've finished several real pages has no effect: the new template is used only for new pages.

Impression uses master pages too. But the master pages are dynamic: template changes are applied even to completed pages. From the DTP viewpoint, this is amazingly ambitious – no other package



even tries – and the difficulty of implementing this feature reliably must have contributed to the development delays.

However, a wordprocessor always allows you to alter things like the page length and margin size after you've written the text – and these are the wordprocessor's equivalent of a master page. So dynamic master pages don't look all that surprising from the WP point of view, and they are a unique blessing in *Impression*.

Printing and graphics

Impression's print options are unrivalled. It uses the usual Risc OS printer drivers (the latest versions are included).

But the print dialogue is more flexible than the competition. For example, it allows you to choose a scale, so you can create tiny 'thumbnail' previews of your pages, and print several on one sheet of paper. And you can print without illustrations if you're short of time.

Graphics are another of *Impression*'s strengths. Sprites or drawings can be loaded into a frame by dragging their file icon.

There are two important differences between *Impression* and *ADP* here. First, any imported graphics maintain their aspect ratio – circles in drawings stay round. Later, you can deliberately stretch, squash, trim, magnify or reduce illustrations.

The second difference is in speed – sprites in particular take a long time to appear in *ADP*, but *Impression* displays them on the screen almost instantly.

A unique method of 'embedding' frames can be used to make illustrations move with the text – a frame containing a graph, say, can be attached to a section of text, so if the text is reflowed onto another page, the picture moves too.

One of the utilities supplied with *Impression* is *FontDraw*. This allows you to type in a short piece of text, then it creates a *!Draw* file containing the shapes of the letters taken directly from the font definitions.

The drawing created can subsequently be manipulated in a wide variety of ways – expanded or condensed, rotated, coloured or turned into a hollow outline with *!Draw* – then imported into *Impression* (or into any other package) as a graphic.

Criticisms and conclusions

Sometimes, *Impression* doesn't do as you expect. It doesn't follow all Acorn's Risc OS guidelines: for example, as you edit a document, it does not show an asterisk in the window title bar as do *!Edit* or *!Draw*. Changing the default filename when saving does save a new copy of your document, but doesn't change the default name – so resaving using the default doesn't save to your new copy but to the original.

To select which style to edit, you use a menu within a writeable field within a dialogue box. And clicking on a window close icon doesn't remove the document from memory – there's a separate menu option for that. None of these are particularly important, but you do have to be wary of these oddities as you work.

Despite the thought that has gone into its design, there are still some strange shortcomings in *Impression*. It allows you to specify measurements (like frame sizes) in inches, millimetres, picas or points, but the picas and points used by most design and publishing professionals are unusable because *Impression* shows 1.333 picas, not 1 pica and 4 points. This needs fixing. Master pages are identified by number, but names are more memorable – '3colA5' is better than 'number 19'.

The fact that you cannot easily tell the master pages apart demanded that I refer to the manual for the one I wanted. Also, picas cannot be shown on the style ruler, and tabs cannot be set precisely by typing in measurements.

Personally, I find it an irritating quirk that Delete Frame is in the Edit sub-menu, not under Frame. And deleting a chapter isn't on the menu structure at all – it's under Alter Chapter.

In all, working with *Impression* is a strange mix of the familiar and the downright quirky. But over a few weeks use, it has become my preferred wordprocessor. The draft character mode, automatic reformatting, and aids such as the spelling checker make it a great writing tool.

And you can set up start-up documents for standard forms like memos, letters and so on that you write every day.

Comparing *Impression* with *ADP* is clearly what most buyers will do, and it certainly scores well. It is convenient and a lot of thought has gone into the overall design of the package.

But the method of overlaying styles, and the dynamic master pages make it stand apart. The chapter structure makes for a powerful tool for long documents, but it has few parallels in other programs. And the latest version still has bugs to catch the unwary who don't save regularly.

However, *Impression* does answer many of the criticisms of *ADP*. It works on an unexpanded A310 or A3000. Importing graphics is sensible, text auto-flows properly, you can use 9 1/4 point text, condensed or expanded, even coloured.

The results in this month's DTP supplement speak for themselves – while it's not without its faults, *Impression* is a far better all-rounder than *ADP*.

Impression *costs £171.35 from Computer Concepts, Gaddesden Place, Hemel Hempstead, Herts HP2 6EX.*

SCREENED FOR VALUE

Microvitec's Cub3000 monitor is aimed fair and square at the BBC A3000. MALCOLM BROWN has given it the once over

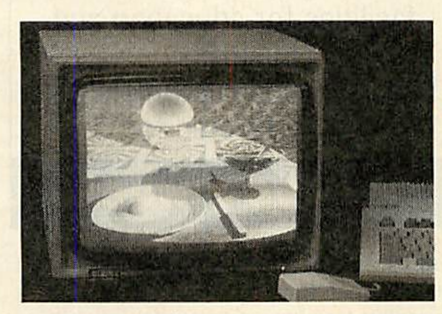
There was a time when no respectable BBC micro would be seen in public without the chaperone of a Microvitec Cub monitor. Inevitably, things changed and although remaining popular, Microvitec Cubs were soon joined by a host of alternative colour monitors.

When the Archimedes appeared on the scene, Microvitec was nowhere to be seen.

But now the A3000 is sweeping the board, Microvitec has given the new BBC micro a vote of confidence by launching the Cub3000 monitor especially for it.

The Cub3000 is, in truth, little different from the old Cub. This is a 'medium resolution' monitor – that is, it can handle 80-column text but it is not the sort of screen you'd want to stare at all day.

Unlike the old Beeb Cub this is an analogue RGB monitor so it can display all the colours produced by the A3000. There is also a 1W audio amplifier and loudspeaker in the case. This connects to the jack socket on the A3000 but unfortunately only provides mono sound.



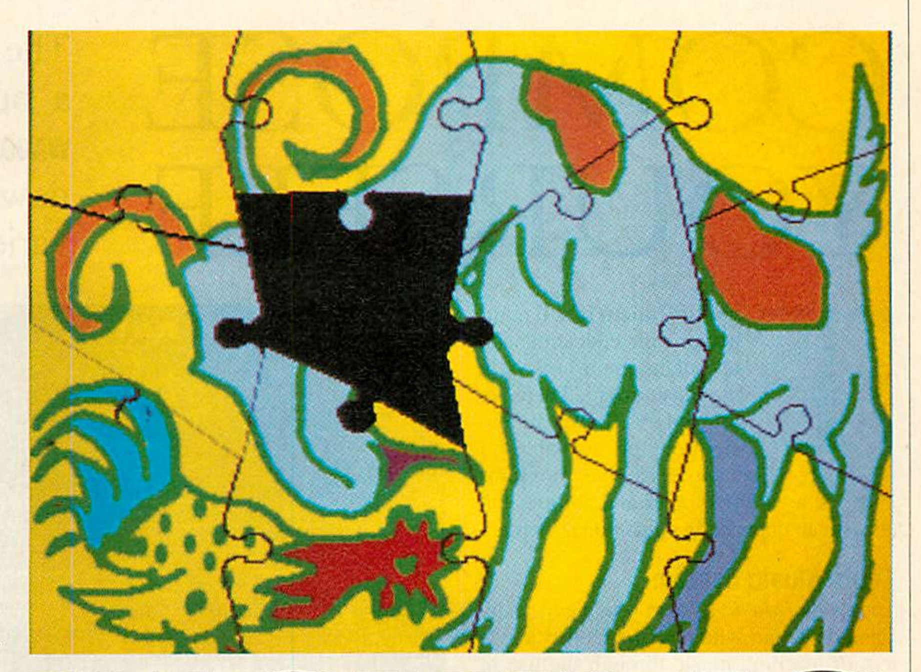
There are just three controls (apart from the power switch) for contrast, brightness and audio volume. Like the old Cub these are on the back of the case.

To get technical, the Cub3000 has a 14in screen with a 0.42mm dot pitch (the red, green and blue dots which make up the picture on the screen are 0.42mm apart) and an 8MHz video bandwidth.

What all this means in effect is that the Cub3000 produces a reasonable picture for everyday use. The real question, of course, is how does it compare with its arch rival, Acorn's Philips model. Well the picture quality is about the same. The Philips monitor is better for detailed work – it seems to have a higher resolution – but the Cub3000 is brighter, more colourful and 'prettier'. It's swings and roundabouts. The Cub has no fold down stand and is much heavier but it is more robust and, of course, British.

You pays your money and takes your choice. Most important is that Microvitec is back in the Acorn market at all.

The Cub3000 costs £265 from Microvitec, Bolling Road, Bradford BD4 7TU.



PICKING UP THE PIECES

No more frantic searching under the sofa or chairs for that last vital piece for **DAVE FUTCHER** thanks to 4Mation's new jigsaw program for the Archimedes

Jigsaws have been a traditional source of entertainment for over a hundred years. Once micros came on the scene a number of programs arrived, enabling adults and children to do electronic jigsaws. Along with electronic sliding block puzzles, these found their way into schools to become popular educational software tools.

Now 4Mation has developed *Jigsaw* for the Archimedes and BBC A3000. It will be a welcome relief to schools deep into the National Curriculum!

Jigsaw is supplied on two discs, one containing the multi-tasking *Jigsaw* program with seven pictures and the other with eight pictures – all original artwork by Rodney Matthews and David Cowell.

The pictures themselves are remarkable works of art. They have been digitized from the artist's originals (with permission) and touched up with *Artisan* and *Atelier*.

Many of Colwell's pictures are just the sort real adult jigsawers love. Pictures of trees, rushing water and butterflies that are incredibly difficult to piece together as many pieces are so similar. Rodney Matthew's work is very sci-fi which will appeal to many older users but may scare the young.

In fact a number of teachers I spoke with did not want to use many of the supplied pictures in their classrooms. In one LEA the Craft, Design and Technology Inspector is supplying schools with a disc of simple screens created especially for five-seven year olds. It is a pity 4Mation does not provide simple pictures for infants.

However, don't let Matthew's bizarre screens put you off. Screens can easily be created with *!Draw*, *!Paint*, *Proartisan* or any package saving screens as sprites. Even the super screens from Resource's *Desk Top Stories* can be imported.

The program works with specially compressed screens which save a lot of disc space, but in true 4Mation style they inlcude the compression routine so normal sprites can be compressed and used as *Jigsaw* files.

Load and go

Using *Jigsaw* is easy. The program uses Risc OS admirably. It installs on the icon bar and pictures are loaded by dragging their catalogue icons onto the *Jigsaw* icon.

A picture can be cut into pieces as you click. When the jigsaw is ready, the screen is divided into three windows. In the upper window are the jigsaw pieces and as the pointer is moved over the pieces an enlargement appears in the window at the bottom left of the screen. If the pointer is moved to this window a small version of the complete picture is shown; if this window is clicked a full sized picture appears. The bottom right-hand window shows the puzzle so far.

Assembling the pieces is very like picking up 'real' pieces. Clicking on a piece selects it and it can then be moved into position. The mouse will rotate pieces and if you find one has been incorrectly placed, it can easily be grabbed and re-positioned.

The picture can be 'cut' into 12, 20, 32, 48, 80 or 120 pieces. *Jigsaw* has 24 different levels of difficulty ranging from 12 to 120 pieces.

Jigging about

There are some rather tricky jigsaws supplied. What about working with pictureless jigsaws or upside down puzzles? You can even use *Jigsaw* to create 'real' card jigsaws too. All you need to do is save a blank sprite and then use *Jigsaw* to create the outlines of the jigsaw pieces as a template to cut out a picture on card.



4Mation has always been an innovative software house. This is the first of a whole series of programs for the Archimedes and it bodes well for the machine's future as an educational tool.

Despite the screens provided, *Jigsaw* must be thought of as a 'content free' package used in any curriculum area to motivate and interest the children. I can see teachers collecting screens to fit in with themes and topics they are doing.

Jigsaw will develop visual discrimination, logic and problem solving. It will also help to encourage co-operation. 4Mation has come up with a new twist to traditional jigsaws, which I am sure will become very popular with the real educational users – children. This is a program for jigsaw crazed adults too, and you can't lose the pieces!

Jigsaw *costs £29 from 4Mation Educational Resources, Linden Lea, Rock Park, Barnstaple, Devon. Tel: (0271) 45566.*

COMPOSE YOURSELF

The BBC micro trains many a budding musician, so **IAN WAUGH** has been trying out five new software packages for a variety of ages and abilities

The BBC micro is still number one in education and one of its main uses is in the music room. There are probably well over 50 music programs available for the Beeb. Here we have five programs aimed at a variety of ages and abilities but all with an underlying educational theme.

Tobin Music System

The *Tobin Music System* was devised by Candida Tobin who also developed a system of teaching music through the use of colour. Many teachers will be familiar with her work.

The aim of the program is to assist the user to compose music – not an easy task even for a music teacher. However, it achieves this by not letting the user enter a note which will not harmonise with the accompaniment. Clever.

The main screen consists of two staves each of four bars, holding a preset chord progression. In the key of C the top stave will be C, G7, G7 and C and the lower stave will be C, F, G7 and C. You can select a 3/4 or 4/4 time signature and a C, F or G key signature although the harmonic progression remains the same whatever the key signature.

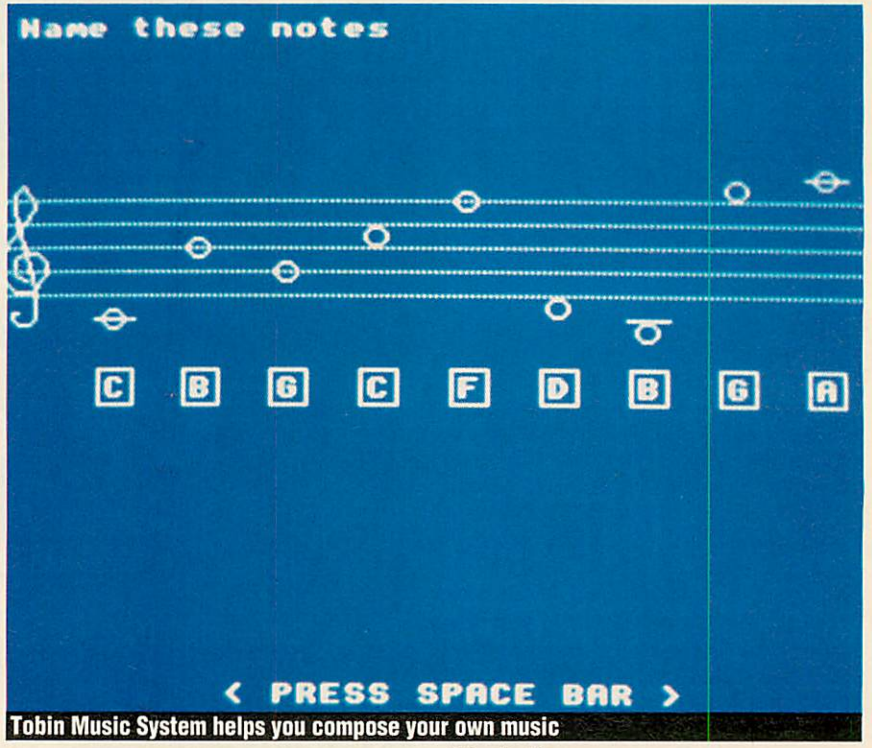
The first four bars play twice, followed by the second four bars followed by the first four again – a standard AABA or sonata form.

First you enter crotchets onto the stave using the cursor keys to move a bird around the screen. It holds a note in its beak (it is aimed at the younger element) and although you can move it to any line or space you can only enter a note if it corresponds to one of the notes making up the chord in that bar.

If this is already sounding complicated, fear not. A stave on the bottom left of the screen shows which notes are allowed (these change from bar to bar) and the program just won't accept a note if it's not right.

The next stage allows you to enter passing notes. These are quavers which are used to 'join up' crotchets.

There are limitations, of course. A passing note can only join two notes of the same pitch (by being placed between them, one note higher or lower) or two notes separated by a line or a space (in which case it is placed on the line or space). Again, the program won't let you enter an 'incorrect' note. A simple vamp accompanies the tune during playback and you can choose from four different instrument sounds for the melody and accompaniment.



Tobin Music System helps you compose your own music

Initially, inexperienced users will probably find themselves producing tunes which sound the same but a little thought and some careful tuition can result in quite individual compositions, for example, by making sure there are no giant leaps between notes and by creating regularly rising and falling note patterns. Tunes can be saved to disc and printed out – a point of prime importance in the classroom.

As an introduction to composition the program is superb. Even if you don't know a C Major from a Sea Captain, you can still produce a piece of music which is all yours. It can then be refined according to taste, experience and available tuition.

Children, even those not musically gifted, feel a great sense of achievement upon completion of a tune.

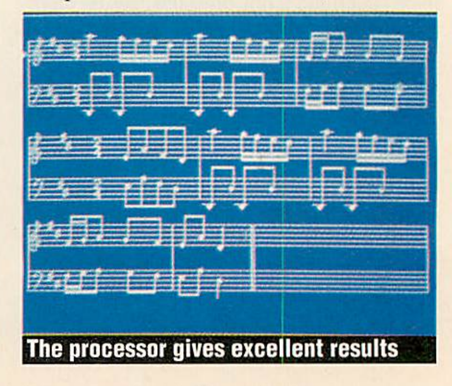
I used the program with some 16-30 year old BTEC Music students and one was heard to remark 'That's the best tune I've ever written'. The program has much value and is highly recommended.

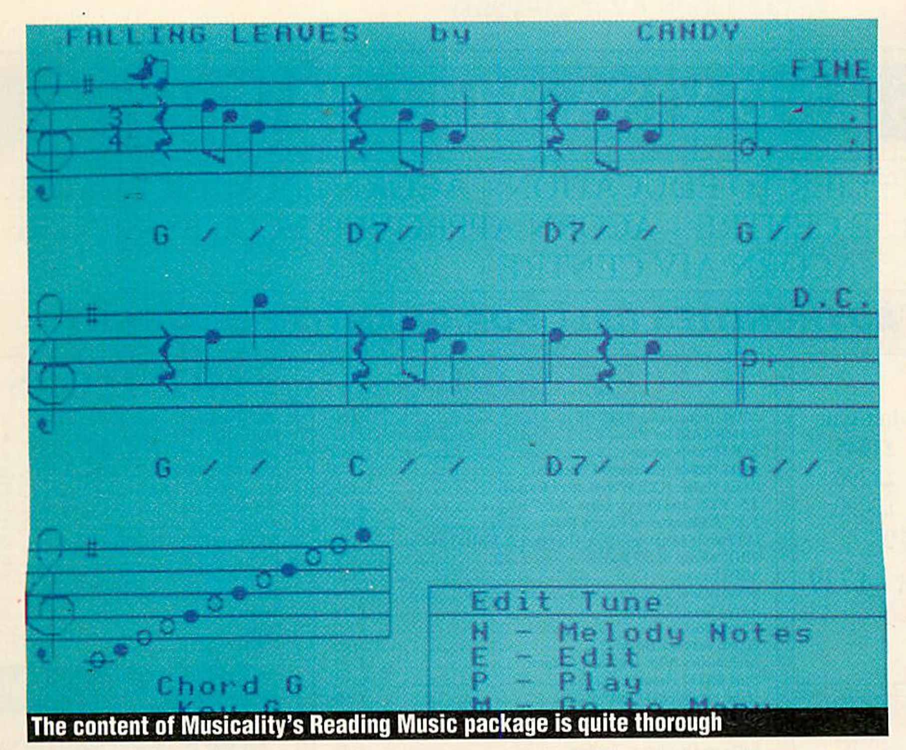
Music Processor

Mid-Sussex's *Music Processor* is a page based system which lets you enter music on up to eight staves per page.

The music can be saved, loaded, edited or transposed and individual parts can be extracted from a score. Editing takes place in a mode 4 screen which prints out as half an A4 sheet.

Notes are placed on the stave by pressing a key A to G. The pitch can be altered with the cursor keys and accidentals are entered by pressing R (raise) for a sharp, L (lower) for a flat and N for a natural. Double sharps and flats are available, too. Dura-


The processor gives excellent results



The content of Musicality's Reading Music package is quite thorough

tions are selected with the numeric keys 0 to 9 and stems can be flipped or removed. Chords are easy to enter. Additional dots for double dotted notes and repeat bar markers are entered by pressing H.

To beam notes, you first enter the notes as crotchets then step backwards beaming each note to the previous one. It may sound odd but it works quite well.

Each stave is independent of the others and you can't push music off one stave onto a lower one although copy functions let you copy from one stave to another.

There's a simple playback option (one part at a time only) which uses the Beeb's speaker but it may hiccup if it runs into too many semiquavers.

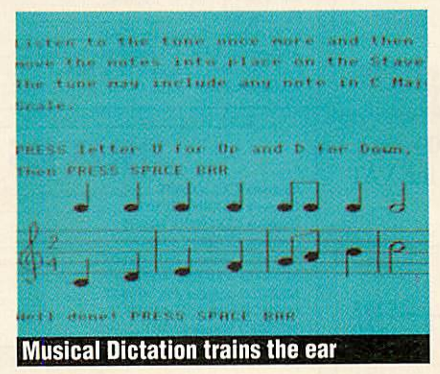
The program is written in Basic and driven from an amateurish mode 7 menu. There's not even a catalogue option.

Response is rather sluggish and there is an enormous amount of disc accessing. The disc is copy-protected but used to store temporary data – that makes me shudder! If you have a two-drive system you can specify the second drive for library files. If you don't, you'll be forever swapping discs.

In truth, the presentation of the program could be improved a great deal without too much trouble. As it stands, it just doesn't have a professional feel to it.

The program doesn't support text or music symbols but the package includes *Music Letraset* (produced by Mid-Sussex) which neatly solves the problem, if in a somewhat roundabout way.

Nevertheless, the results are excellent. It uses the printer's bit-image capability to produce the music rather than resorting to a screen dump although it takes a little time for the computer to construct the image. It produces by far the best music output I have seen from a BBC micro.


Musical Dictation trains the ear

Playbeeb

Playbeeb is for three-seven-year-olds and its main aim is to teach the concept of high and low, which it does using four programs.

The first draws a stave on screen, so large that it fills it. Pressing the middle row of keys on the computer keyboard plays a sound and draws a face on the stave. The letter pressed has no relation to the note. In the second program the computer plays a series of tunes and the notes are shown on the large stave as they play.

The third program is similar to the first except notes are indicated on a large piano-style keyboard with car and man figures. The fourth program plays tunes and shows the notes on the piano keyboard.

The programs are very simple. They may be worth considering if a child or student is having difficulty with the concept of high and low, but once this is grasped the programs will rapidly be out-grown.

Reading Music

Once you've fathomed Musicality's pricing structure, the rest seems quite easy! Actually, it is responsible for two mammoth packages. *Reading Music* contains 18 programs and *Musical Dictation* 24. However, the layout and the organisation could be considerably improved.

Reading Music, for example, is divided into *Parts*, *Programs*, *Sections* and *Chapters*, which does little except confuse.

Notes are positioned on the stave with the U (for up) and D (for down) – why not the cursor keys?

You can't escape from a program once you begin and you can't skip questions. You are only scored on the final two test papers which – unbelievably – ask the same questions every time.

The content, however, is quite thorough. *Reading Music* takes you from basics such as rhythm and pitch up to musical terms and signs, tonic triads and key signatures.

If you answer incorrectly you may be given a hint or referred to the relevant program and section number for revision which is a useful feature.

Musical Dictation

Musical Dictation is a set of aural training exercises – the music student's least-favourite topic. Again, some areas of implementation could be improved. For example, some questions ask you to enter a sequence of note durations but if you make a mistake you can't erase the last one. If the answer is wrong everything is cleared.

You generally hear a sequence twice – no third chance. If you can't get the answer, tough – the program won't tell you, you just have to keep plugging away until you get it right, or press BREAK.

But, like *Reading Music*, the content is thorough. You begin with simple high/low exercises followed by long and short note durations and build up to combinations of pitch and rhythm.

It's just a shame the developers didn't put more thought into the implementation because ease of use and user-friendliness go a long way in educational programs of this nature. But if you can live without these, the content is worthwhile.

Tobin Music System *costs £11.95 from Helicon Press, Knight Street, Sawbridge, Hertfordshire CM21 9AX. Tel: (0279) 722318.*

Music Processor *costs £54.95, and* Playbeeb *£7.95 from Mid-Sussex Software, 11 Bridle Way, Pound Hill, Crawley RH10 4HP. Tel: (0293) 882130.*

Reading Music 1 *(four discs) costs £26,* Musical Dictation 1 *(three 80-track discs) costs £20 or (five 40-track) £26 from Musicality Software, 15 Cheddington Road, Edmonton N18 1LT. Tel: 01-803 9449.*

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NEW LAMPS FOR OLD

The BBC model B can be upgraded to the specification of a Master with Computech's latest Integra-B board. **DAVID JANDA** equips his ageing Beeb

With so much publicity devoted to the Arc and Master, Beeb users would be forgiven if they felt left out. Of course, time moves on and so does technology but that's little comfort to you if all you have is a humble Beeb looking more dated as the days go by.

When the Integra-B board was first reviewed, in the July 1988 *Acorn User*, many companies were offering trade-in deals on model B's for Master 128's. A year and a half has passed since then and few companies are still making that offer.

What's more, the average trade-in price for a model B (issue seven board) is now only £125-150. So, although the Integra-B costs over £100, for Beeb owners it's still a cost effective alternative to purchasing a Master 128.

Since the original review, Computech has released a new version of the Ibos firmware which controls the board, and modified the board itself (now issue 3).

The Integra-B expansion includes 64K of sideways Ram (four banks of 16K), eight sideways Rom sockets, 20K of shadow Ram and 12K of private Ram used by the real-time clock and Integra configurations. A system disc containing application notes, a windowing system and software patches for popular packages is also included.

Documentation consists of a 65 page user guide and application notes. An optional 43 page technical reference manual is also available which acts as a supplement to the Advanced User Guide for the BBC micro.

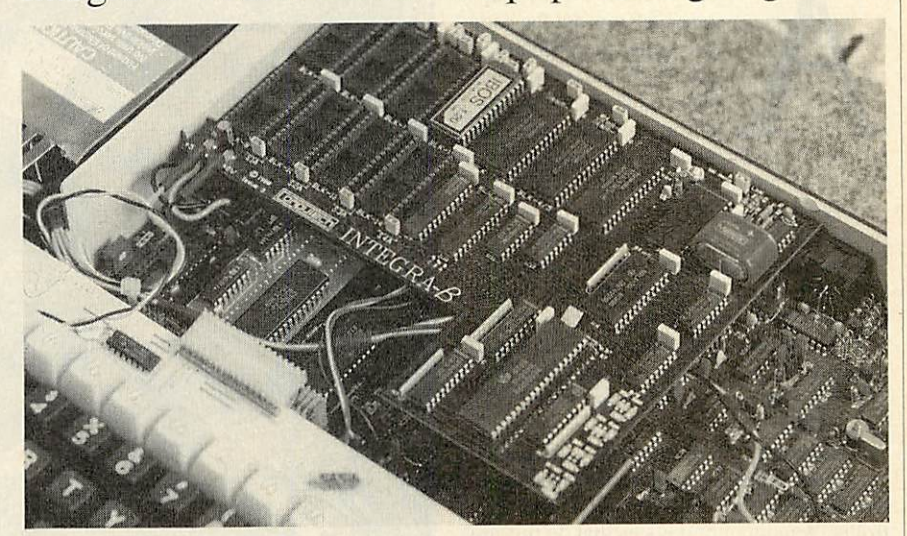
Optional extras include extra Ram and a rather neat write protect switch assembly which fits on the rear of the Beeb's case. This is not a requirement for the standard 64K of sideways Ram as two jumpers may be removed instead. However, it is far more convenient.

Thanks to clear instructions, installing the Integra board is simple – just remove the 6502 processor and fit it on the Integra board. Power and control lines need to be fitted onto the main board but these are clearly labelled and no soldering is required.

Alas, the disc controller board of most double density filing systems will be too high and gets in the way of the Integra board. Computech provides a service to reduce the height of DDFS boards, allowing them to be used with the Integra system.

This latest version of the board has been slightly modified to solve timing problems associated with some Pal-Prom devices which are used to support 32K and larger capacity Roms. I found using *Interword* and the *Solids RGL* Roms on the board now presents no problems at all.

The Ibos firmware provides many additional star commands as found in the Master's OS. These include *APPEND and *SPOOLON. *TYPE to print a file to printer and, if the ADFS is fitted, *CREATE will create an empty file of a certain length.



Rom/Ram management is well catered for. A list of active Roms is displayed with *ROMS, and *UNPLUG and *INSERT saves wear and tear. Preparing a bank of Ram to accept a Rom image is done with *SRWIPE and *SRLOAD loads a file into the appropriate bank. The Master's *SRDATA is also included as is *SRREAD and *SRWRITE for reading to and from sideways Ram and the computer's main memory.

The Integra-B is fitted with battery backed Ram for storing up to 17 configurations. These include disc stepping rate, mode default and such like. In fact the Integra board negates the need for a Dip switch setting on the Beeb's keyboard as all the functions (and far more) are set with the *CONFIGURE option.

Besides using sideways Ram for Rom images or data it can also be used as a printer buffer with the *BUFFER command. 8K of private Ram is reserved as standard but up to 64K can be used. Here lies my only complaint regarding the Integra system. There is no indication of how much Ram may be reserved for a printer buffer when the *ROMS command is used. Instead *BUFFER ? is used to list the size of buffer and which Ram banks are reserved for it.

Real-time clock commands include *TIME, *DATE, *CALENDAR and *ALARM. The date command is displayed in the form Thu,01 Feb 1990. Used together with numerous calculations such as *DATE + it would display Fri,02 Feb 1990. An alarm function with repeat is also provided.

Shadow Ram on the Integra board differs from the model B+ ,128 and Master in that shadow Ram can only be used for programs and data, not for screen memory.

*SHX ON/OFF get around this problem by exchanging the contents of shadow memory with main memory.

The system gives the Beeb user many of the features found on the Master 128 and you'll appreciate the difference. The system enhances the Beeb greatly, and all the components work well together.

Of course, at £135 it is quite an expensive outlay for an old machine but your faithful Beeb is well worth it.

The Integra-B board costs £135, 32K Ram chip £16, write protect switch (2 out of 6 fitted) £7 and the extra switch unit £1.50 from Computech, 2 Belle Isle Terrace, Main Street, Grange over Sands, Cumbria LA11 64E. Tel: (05395) 34604.

DRIVE ON

Adding an external disc drive to your Archimedes requires the fitting of one of the range of disc buffers that **SEAN SOLLE** has been busy surveying

Archimedes owners upgrading from Beebs soon encounter the problem of transferring data between their old and new machines. What with the Arc's early serial interface problems (thankfully now cured) and the 3.5in ADFS format, it's a real challenge to run ported applications under the 6502 emulator!

Connecting a BBC disc drive is also awkward, for unlike the Beeb, the Arc has no buffering between its floppy disc controller and disc drives. This prevents 5.25in and some makes of 3.5in drives from being used since they put too great a load on the controller chip.

Fortunately, the problem is easily solved by a small piece of interfacing circuitry to buffer the signals between drive and controller. A number of devices that do this are now available from a range of suppliers.

All these buffers were tested on a 310 and a 410, using a 3.5in drive supplied by Matmos and an old Akhter 5.25in drive.

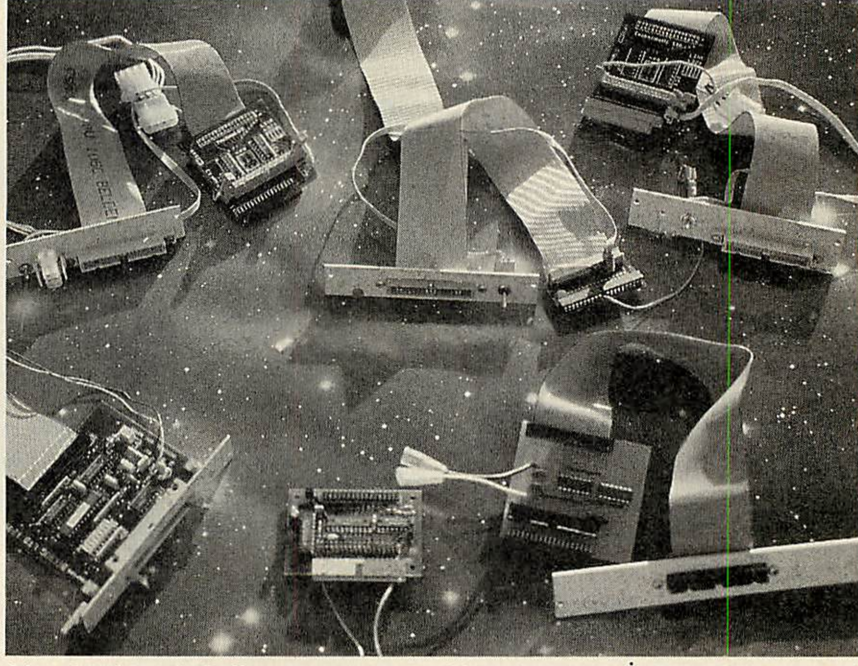
Curiously, the 410's disc drive cable must be fitted the opposite way up to the 310's. It would be advisable to specify which machine you need the interface for, as some cables have connectors with polarising notches. These can't be inserted upside-down, which means re-crimping the connector the other way up to fit it to a 410.

Installing any of the buffers is straightforward enough, as all the instructions provided are adequate. In most cases it is simply a matter of replacing the disc drive cable inside the Arc with the interface, and fitting a backplate containing the 34-way connector at the rear of the machine. No soldering is required on the interfaces.

Once fitted, standard BBC disc-drives may be connected, but they must have their own power supply. Powering an external 5.25in drive from an Arc could seriously hurt it. I was therefore surprised to find Technolog's buffer has an optional BBC-style power connector for an extra £3.

Table 1 compares the various merits of the interfaces, and the following text describes each of the features listed.

BBC drives are usually configured as



drives 0 and 1 so the buffers remap these to Archimedes drives 1 and 2 – without having to open up your disc drive to change links.

But when using the PC emulator, it's handy to have a 5.25in drive as drive 0, and rather than altering links on a pair of disc drives, some interfaces have jumpers to swap drive 0 with an external drive or a switch on the backplate.

Connections

The interfaces connect either by plugging the buffer board directly into the disc drive connector on the Arc's main PCB, or with a cable linking Arc to buffer.

The buffer boards need power from the Arc and they connect either piggy-back on to the hard disc 4-way power connector, or the main 0.25in spade connectors providing power to the Arc PCB or backplane.

The former method is probably preferable, as the spade connectors are quite a tight fit and the main Arc PCB can flex alarmingly when unplugging them.

Beebug

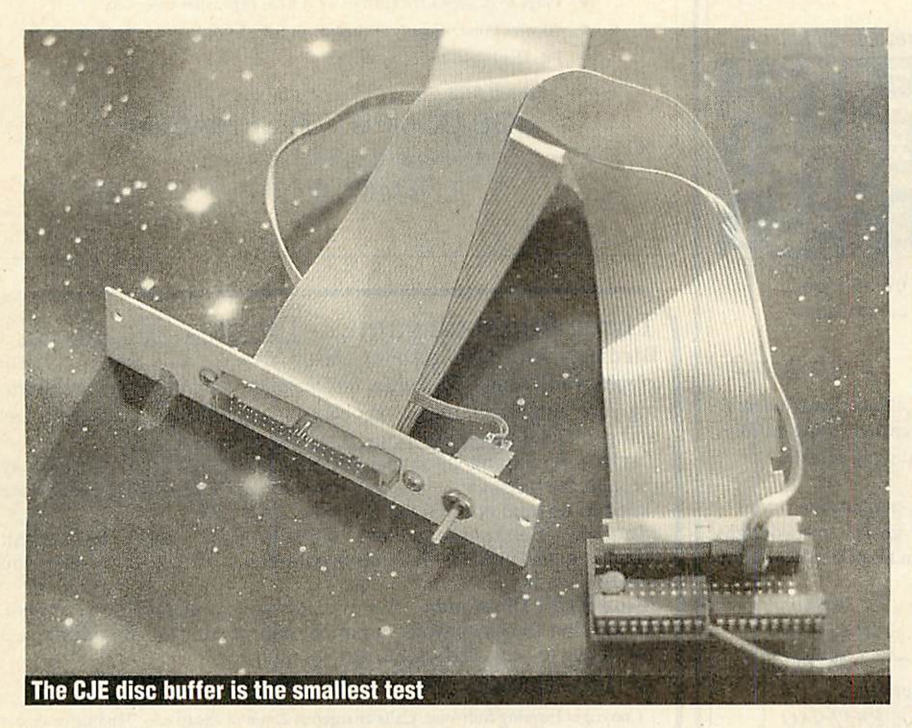
Unique to Beebug's MKII interface is 40/80 track switching. This allows external drive 0 to be double-stepped so that 40 track discs may be read in 80 track drives – a neat touch and very useful if your drive isn't switchable itself. This is also the only interface bolted to its backplate, making it the easiest to change links.

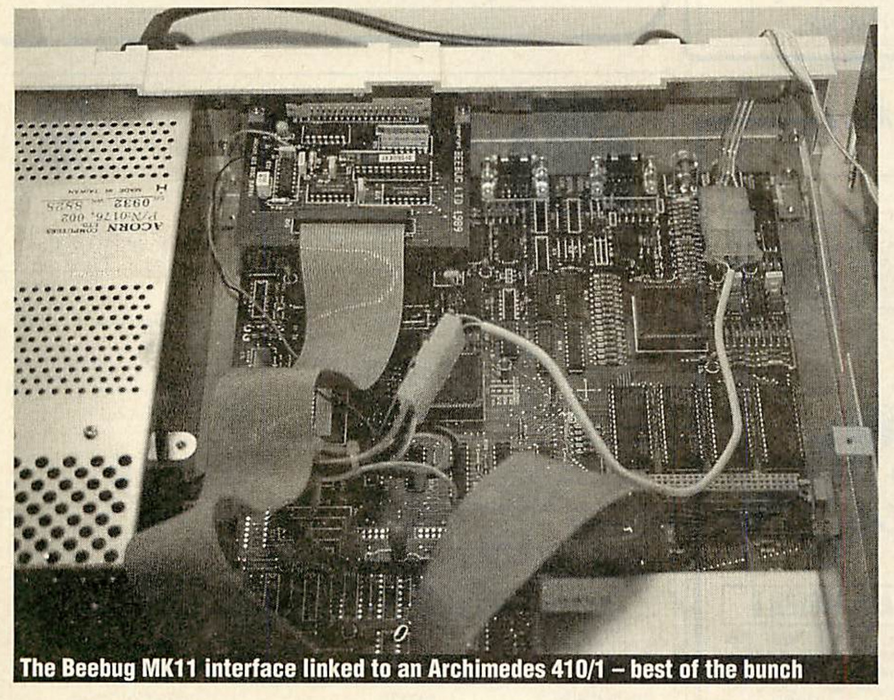
Beebug also supplies a DFS Disc Reader for £10.42, which can be used with any of the interfaces. It is supplied on disc as a relocatable module. Once loaded, this provides DCAT, DEX, DINFO, DCOPY and DBACKUP commands. As well as reading and copying standard Acorn DFS discs, this can cope with Watford DFS 62-file catalogue and double density discs, and is probably the best-value utility I've come across.

CJE

CJE Micro's board is the smallest on test, measuring only 30x55mm, and plugs horizontally into the Arc. An additional cable is required to re-map the external drive numbers.

However, the instructions do explain how to reconfigure the drives themselves. Unless you share the external drive with a


The CJE disc buffer is the smallest test


The Beebug MK11 interface linked to an Archimedes 410/1 – best of the bunch

	Beebug	CJE	HCCS	Technolog	Technomatic	Watford
Price	£34.50	£30	£27.60	£34.44	£34.50	£24.15
Backplate	o	o	o	o	o	£19
Remaps drive no.	o	.	o	o	o	o
Drive 0 swap	switch	link	.	switch	switch	link
Drive Connector	cable	PCB	PCB	PCB	PCB	cable
Power Connector	cable	.	spade	cable	cable	spade
40/80	o	.	.	.	.	.

Table 1. A summary of how the disc buffers compare

BBC, the cable isn't really necessary. Drive 0 swapping is possible by changing links, or with an optional switch on the backplate.

For £20, CJE also supplies a DFS utility disc which reads, writes and formats DFS discs. However, occasional problems occur when writing to DFS format discs, and on examining the Basic listing, it appears the program is not correctly updating the catalogue sectors.

HCCS

The HCCS board is the simplest of the batch, consisting only of a pair of IC's and the necessary disc and power cables. Unlike the other interfaces, the backplate is full-width and being of extremely heavy gauge steel, it doesn't flex annoyingly when connecting the disc drive.

Technolog and Technomatic

Technolog's and Technomatic's interfaces are virtually identical and are in fact both made by the former. Like the HCCS board, the PCB plugs vertically into the drive connector on the main board.

The interface is normally configured for one internal drive and three external. To change this to two internal drives requires soldering, which Technolog will do for a nominal charge.

This is annoying, as the cost of fitting movable links would be very small and would simplify matters enormously.

However, Technolog wins brownie points by being first on the scene with a recently announced version for the A3000, which plugs horizontally onto the CPU board.

Watford Electronics

Watford's MKII board fits neatly above the Arc's internal disc drive on self adhesive pillars, connecting to the main PCB with a cable and thus putting no stress on the connector.

This is definitely the best value for money board on offer. It is a no-frills design but probably the choice most tight-budgetted educational users will choose, ignoring the backplane and switch that bump the price up by £19.

Conclusion

If you sold your trusty Beeb to buy the Archimedes, if you want to use 360K PC format discs, or if your hard disc means you just can't cram another drive inside the case, an external interface is an essential piece of kit!

The Beebug board is the best of the bunch but it is the most expensive too. If funds won't stretch that far, all the others provide the goods and good value.

Thanks to Khalid Owen of Microfix, Canterbury for the use of the Archimedes 310 for this review.



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☆☆☆ ***For the Archimedes*** ☆☆☆

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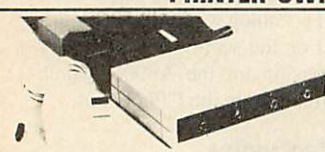
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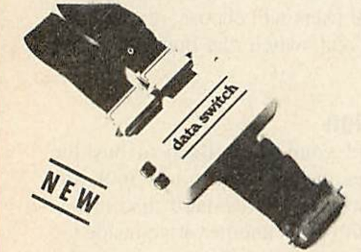
Quality Products for the BBC Micro

PRINTER SWITCH-BOXES



These high quality 3 and 4 way printer switch boxes are ideal for use in schools and colleges The switch is extremely cost-effective it will allow up to four micro's to share just one printer by simply pressing a button. Both versions come complete with all cables. The PS4 box has 2 x 3.7m + 2 x 1.7m + 0.4m to the printer, the PS3 has same but only 1 x 3.7m. Data buffers are fitted to the extra long 3.7m cables to give reliable data transfer.

PS3 3 BBCs to 1 Printer £59.50
PS4 4 BBCs to 1 Printer £69.50

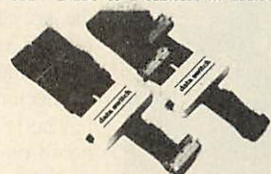


This quality switch box is designed for the Archimedes / A3000 range of computers and IBM PC compatibles. The ribbon cables supplied are 2 x 1.5m + 0.4m to the printer. The unit can also be used with a parallel plotter.

PS5 2 Archimedes to 1 Printer £34.50

These useful switch boxes are ideal for use in the office or at school. No need to keep swapping cables over just press the button! The cables supplied are 2 x 1.7m + 0.4m with appropiate connectors fitted. Both version may be used with a plotter if required. Super value.

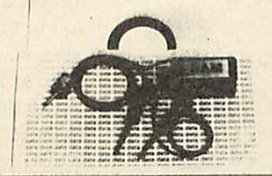
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FIRST UP

The first real wordprocessor for the Archimedes has been updated as the first of a series of Acorn productivity tools. **GRAHAM BELL** scribbles a few words

The advent of Risc OS in early 1989 brought early obsolescence to the first real Arc wordprocessor, *First Word Plus*. While the Arthur-based original could be used under Risc OS, it required some modification and still took no advantage of multi-tasking, easy data exchange or the familiar user interface. Version two brings *First Word Plus* right up to date.

The two unprotected discs and manual are packaged in a substantial and attractive box, together with a registration card and keystrip.

The application boots up and installs the most boring icon yet seen on the icon bar. It grabs around 400K of memory, so there's plenty of room – even in a 1Mb machine.

The main display shows a grey ruler across the top of the window, which controls the current line length and tab settings. Below this is the text, drawn in a dark grey. Black is reserved for bold, and a pale grey for 'light'text. Italics and underline are also shown clearly.

The plain 8x8-pixel system font is used rather than the anti-aliassed graphic fonts, which makes for a clear and legible screen and fast scrolling. But the readability of the text would be improved if a little space were introduced between lines.

You can load and save *First Word Plus* own files and save plain text files too (to use with *!Edit* and so on) but there's no provision for loading direct from *!Edit* (the manual gives a series of search and replace operations to prepare *!Edit* text beforehand) nor for loading any 'foreign' wordprocessor formats. If you've just upgraded from a Beeb or a Master then Software Solutions' *View-1WP* and *Wordwise-1WP* conversion utilities are a must.

The text editing, page layout features and most of the other commands are fairly familiar stuff and it all works smoothly after very little practice. It's a very effective writing tool, and new in this version is a useful swap case.

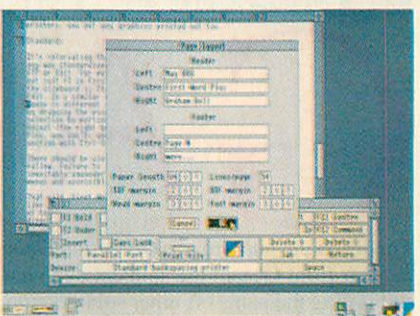
Most commands can be accessed by CTRL-key shortcuts or function keys. The short-cuts appear on the menus too, so you gradually learn most of them even without the manual.

There's a spelling checker with a respectably-sized dictionary and sensible automatic hyphenation if you want it. You can add footnotes to the text and incorporate sprite files (not *!Draw* files) into the document.

With several separate windows, you can work on up to four separate documents at once and cut and paste text between them but as with the original *First Word Plus*, there's no way of having two views of the same document.

There were two fundamental design problems in the original *First Word Plus*, and both of these remain.





The first affects hanging indents – you can't have them (reformatting the text destroys them). The second arises from the fact that tabbing, centring and the like insert fixed spaces into the text, not real tabs. So if you change the ruler width, 'centred' text doesn't move.

Printing your document is simple, though it's not integrated into the Risc OS print architecture (so make sure the Risc OS driver isn't printing anything else when you decide to print a *First Word Plus* file). *First Word Plus* comes with its own set of printer drivers covering most dot-matrix and daisywheel models (but no Integrex colour, laserjet or Postscript).

You can customise your own drivers but this does seem like an insane step backwards. Printing is always done from disc, so you can work on another document while it's printing.

It is quick, and uses the printer's own characters so you get good value out of any NLQ options you paid for.

There's a utility, *!1stChars*, which allows you to type in any special characters your printer supports that aren't on the keyboard, and on dot-matrix printers, you get any graphics printed out too.

Standards

It's infuriating that things like key shortcuts aren't in any way standardised. They aren't even the same as Acorn *!DTP* or *!Edit*. For example, to get italic is CTRL-f3 in *!DTP*, but just f3 in *First Word Plus*.

Cutting from the text to the clipboard is CTRL-f7, CTRL-D in *!DTP* and CTRL-X in *!Edit*. The use of the mouse to select areas is different too.

There are clear guidelines for software authors to follow. Failure to standardise features like this will inevitably squander much of the ease-of-use gained through menus and accessible multi-tasking.

That said, *First Word Plus* does feel for the most part like 'real Risc OS'. It's simple to write text, check style and spelling, then transfer it direct into Acorn's *Desktop Publisher* by dragging the file icon.

Text styles like bold and italic survive and if you have the necessary 2Mb of memory to run *!DTP* and *First Word Plus* together, it's a neat system.

Without Acorn *!DTP*, though, it's fairly limited. Apart from footnoting and incorporating graphics, there's little you can do that cannot be managed on a Beeb using *View* or *Wordwise* (with help from *SpellMaster*). It may be considerably easier to accomplish on the Arc, but there's no giant leap forward in capability.

If that's the sort of simple system you're looking for and you plan to stick with a dot-matrix or daisy printer then *First Word Plus* will suit you well. I liked it, just as I did the original Arc version.

However, things have moved on in the last two years. If multiple columns, smart graphic fonts in different sizes or illustrations from *!Draw* feature in your plans, and particularly if you aspire to a laser printer, then *First Word Plus* is certainly not the best choice. *Impression*, and even *Pipedream* are better tailored to your needs.

First Word Plus *version 2 costs £92 from Acorn dealers. Upgrades from version 1 cost £45.*

Every time a magazine mentions its user base, the Electron seems to be a great source of amusement in the Acorn games world. Well I have a message for all Electron users out there. The hardware company, Pres has released a multitude of games compendiums on 3.5in and 5.25in discs.

Virtually all the golden oldies have been nabbed, including *Magic Mushrooms*, *Arcadians*, *Frak*, *Planetoid*, *Zalaga* and even *Miller Gorilla* (surely some mistake there...). The discs cost £11, give or take a few pennies for different formats, with eight games each. Pres can be contacted on (0276) 72046.

Repton Infinity fans still struggling despite the publication of the passwords program last month may like to know of the various built-in cheats, courtesy of Barnes Cook from California. Presented with the five option menu, and having selected 'play game' hold down the keys spelling CHEAT while the game loads. It is tricky on the Master version as it loads virtually instantaneously – but it is possible!

This allows you to move on the map, by holding down CTRL-M while playing (again rather tricky).

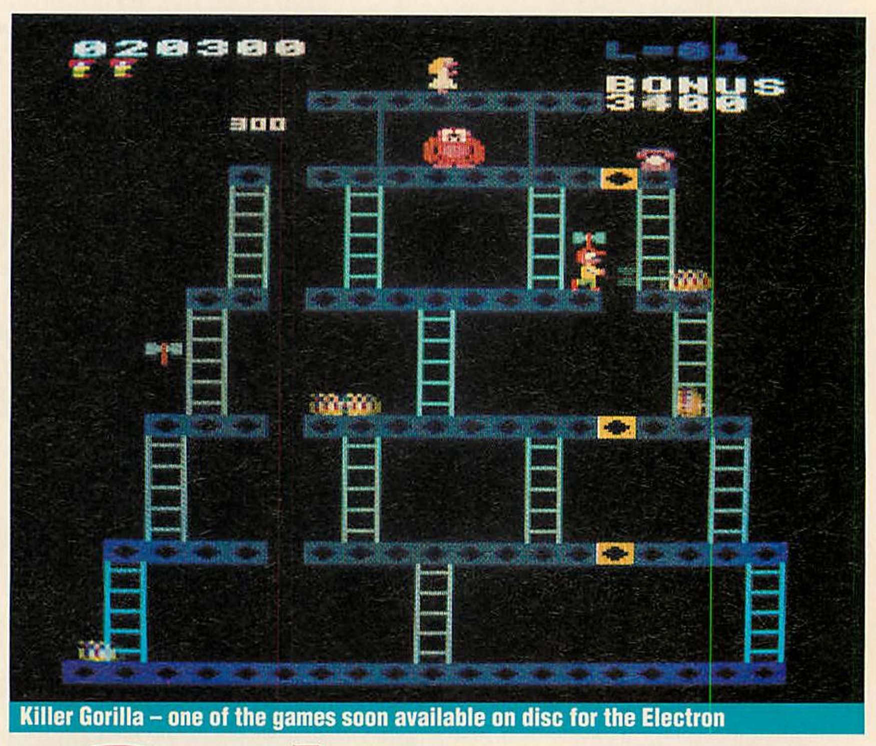
For Master owners only there is a hidden message (long!) which can be accessed, again, from the five option menu. Start at 'play game' and press B. Then move down to 'editors' and press A. Move down and press N. Down again to press J and finally O.

The best things for Archimedes owners coming up are the so called 'pilot games' from the big companies. They are timidly dropped into the market to test the water for future games – so buy them! The most eagerly awaited at present is *Hard Drivin'* from Domark, due a couple of weeks before Easter.

Virgin Mastertronic's Leisure Genius label has *Monopoly* in the pipeline. Unfortunately the pipe may not end until the summer and even then it could stop with a closed end. Apparently though, the 8-bit versions are still selling fairly well, hence the company has high hopes for the Arc.

US Gold is producing a game called *E-Motion* for the Arc. Whether or not we will see it, is dictated by the market of the day. An interesting point is that the code, graphics and sound were mostly written and designed on the Arc in the first place. They were then converted into Amiga and ST format for sale in the shops.

The author used the Arc as a development machine because it was the best for the job but the game itself is essentially for those with only half a mind to buy them – the 16-bit crowd (half a mind, Gettit?)



Killer Gorilla – one of the games soon available on disc for the Electron

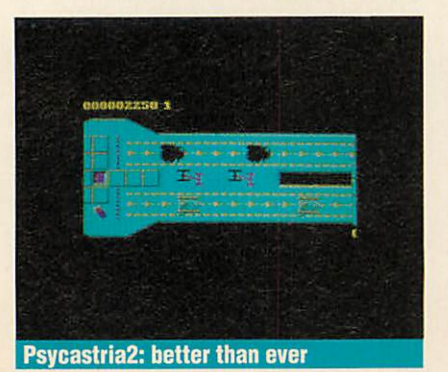
GAME

Finally on the pilot front is *Operation Thunderbolt* from Ocean, the soldiers-eye view of blasting the pants off other soldiers from an armoured haven. Start looking out for it in May.

The Fourth Dimension's Archimedes *Liberator* game name is no longer the same. Now called *Apocalypse*, the 'super 3D graphics plotting routine' that it is based on has unfortunately fallen through the floor and out the window. However, alternative algorithms have been found.

In the Beeb dimension is a game called *Inertia*, which is apparently a cross between *Marble Madness*, *Orbital* and *Imogen*, and *Nevryon*, which is a sideways scrolling shoot-em-up with 'jazzy graphics'.

Sam Greenhill



Psycastria2: better than ever

Fab Four

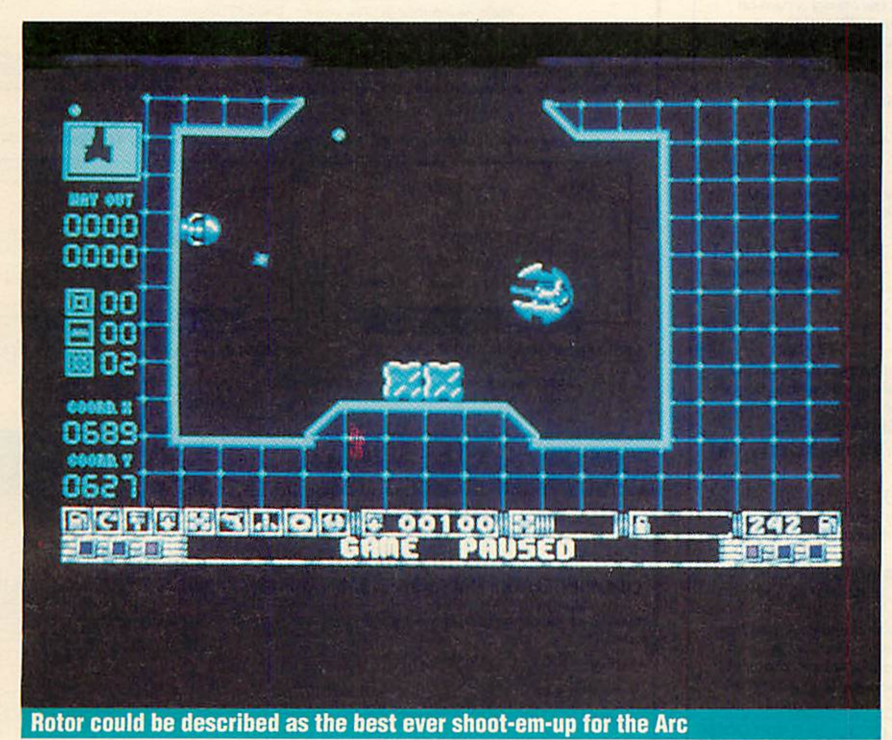
Audiogenic Tel: 01-861 1166
BBC cassette £9.95, disc £12.95, Electron cassette £9.95

Publishers sometimes yield to the temptation of watering down compilations with an offering that's below par. Not so this pack, which features four games from two of the most talented individuals in Gamesland, Gary Partis and Peter Scott, two programmers with contrasting styles but comparable skill.

Even if you already have all these games, there's something for you here, as Gary Partis' offerings, *Psycastria 2* and *Sphere of Destiny 2* are, to coin a phrase, 'remixed' versions of the classic originals, now even more playable than before, and with screens not seen before in *Psycastria 2*.

The Partis forte is creating games which call for lightning fast reactions, whether you're controlling a peaceful bouncing spherical object or shooting 'em up from a novel perspective. There's little subtlety here but plenty of action.

Flip the disc and you're in a different world. Peter Scott's *Arcade Adventureland*, with all his usual trademarks – amusing animated action hopping about all over the place, realistic fiendish puzzles and novel



Rotor could be described as the best ever shoot-em-up for the Arc

SHOW


Deadly creatures from Omega Orb

touches such as a computer you can interrogate with its own language.

The animation is so realistic and the characters so lovable, you're soon involved enough to care deeply about their fate, whether you're playing the stranded weaponless spaceman in *Thunderstruck 2* or the cute but deadly bouncing creature in *Omega Orb*.

Both games work on the principle of contact with nasties decreasing energy levels rather than spelling loss of life, which means that you don't have to be absolutely perfect while you're learning.

One of the best compilations yet for the Beeb. Very highly recommended.

Bernard Emblem

Rotor

Arcana Tel:(0272) 297162
Archimedes £24.99

Hands up all those who pine for that all-time-favourite, *Thrust*, to play on their Arcs. The wait is over and it's been well worth it.

Rotor takes all the best bits from *Thrust*, to make what can only be described as the best yet shoot em-up on the Archimedes. The aim is to pilot your 'rotor' around a series of caves and tunnels, collecting enough sun-crystals to escape from an enemy fortress.

The task is not an easy one, especially when you have enemy cannons firing up your after-burner. Just when you think you're stable, a localised gravity field is on hand to suck you in or throw you against the nearest wall. Flying the rotor is difficult, so a training mode is provided. Provision is made for mouse control although the keyboard feels easier and more responsive.

As well as the sun crystals, there are a number of extras that can be collected to upgrade your ship. When you first start a mission, the rotor is a slow and cumbersome craft. But once you've got all the add-ons, you can go off around the tunnels, blasting everything in sight with little chance of the slightest scrape. The graphics and sound in *Rotor* are a direct port from the 16-bit version of the game.

But that isn't to say that they're bad, quite the opposite really. The ship has a metallic look and the backdrops are excellently drawn with realistic drips of water.

Sound comes in the form of a realistic collection of arcade-like bangs and crashes. Connecting the Archimedes up to an amplifier gives a real sense of 'being there'.

Arcana should be congratulated on its commitment to the Arc and I look forward to future releases with anticipation.

Rob Miller

Perplexity

Superior Tel:(0652) 58585
BBC cassette £9.95, disc £11.95, Compact £14.95, Electron cassette £9.95.

Perplexity is one of those games which you'll either like or hate. As soon as the game loads a repetitive tune starts playing. This soon starts to grate but luckily you can turn it down or switch it off (thank god!). The sound effects are much better and add to the atmosphere of the game.

The game looks very similar to *Pacmania* but has a puzzle element in between the action. The character (who is also similar to pac-man) has to complete 16 levels of brain damaging puzzles.

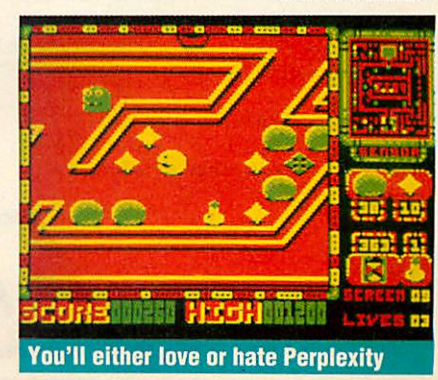
To complete a level, the character has to collect all the diamonds in the maze in the face of lethal monsters and boulders which block your way and cannot be destroyed.

To complete a section of the maze a key is needed but it's up to you to find what key goes where.

The graphics are not bad but the colour in the background is irritating. The scrolling is good with fast updates making it smooth but the 3D effects could have been more solid. It looks like the main sprites are floating in the maze.

Overall, this is a good game mixing arcade action and puzzles well. A classic for your collection, but you might end up smashing your Beeb in frustration if the puzzles are too much or you push the key in the wrong gap!

Enver Mehmet



You'll either love or hate Perplexity

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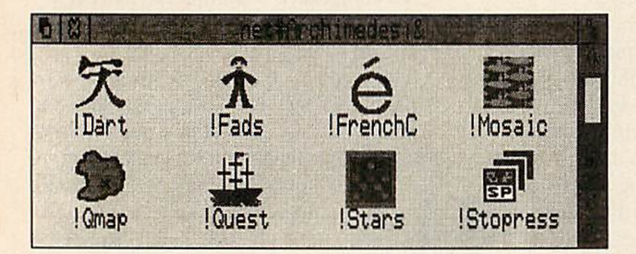
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TURNING A NEW LEAF

As the paperless office finds itself struggling to become a reality, **MARTIN PHILLIPS** uncovers two programs which aim to take over from books

Hyperbook is a text retrieval system, designed to help users do more effectively what they already do with printed books. It aims to retain a layout and feeling as similar as possible to that of a conventional book but uses the computer to extend the power of familiar literary devices such as footnotes, glossaries and indexes.

Versions of *Hyperbook* are available for the IBM PCs and compatibles as well as for the Arc.

On the Archimedes, *Hyperbook* does not make much use of the Risc OS environment. When *Hyperbook* loads, it askes for the name of the book to be loaded. At this point the disc can be changed and a *Hyperbook* text disc inserted.

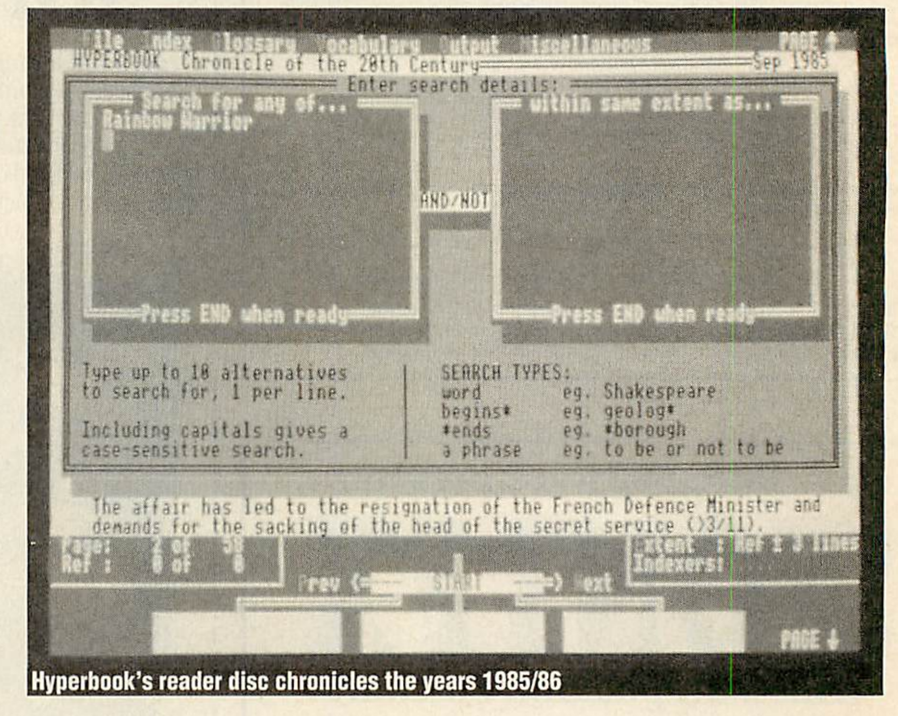
There can be more than one *Hyperbook* text on a single disc, and as *Hyperbook* compresses the text, it is possible to have over 100 pages of text stored on one disc.

Once the text has been selected the main screen will appear with a menu bar at the top from which pull-down menus can then be obtained.

The bottom six lines of the screen form a map area which gives details of the current index, page numbers and other related information. Pages can be viewed directly using the arrow keys or the mouse and are presented as actual pages although only part can be displayed on the screen at once.

While moving the mouse up or down allows the whole page to be scrolled, it is not possible to scroll from one page to another. It is necessary to select the next or previous page.

Although this aims to preserve the feel of an ordinary book, I found it limiting, especially when the reference was on the last line of a page.



Hyperbook's reader disc chronicles the years 1985/86

Searches can be made by going to the index option in the menu bar and selecting a new search. Up to 10 alternative search words or phrases can be entered. Underneath the search box there are some helpful hints which save having to resort to the handbook each time it is used. Once the search words have been entered, pressing the COPY (END) key moves on to the next option. This selects either a simple search, or one using the operators AND or BUT NOT.

The program takes suprisingly little time to search the text, so you can quickly move to any references found. A particularly elegant touch is the way it treats capitals.

This is always a problem with databases (which is basically what *Hyperbook* is). If the entry is in lower case, then capitals are ignored, and the program will find all entries irrespective of the use of capitals. If, however, capitals are used in the search word then the search is case dependant.

With such a neat solution it is a shame that *Hyperbook* does not automatically switch off the caps lock at this point.

Hyperbook does make searching a text an exciting experience. Once a search has been started, it is possible to start another search and then return to the previous one. It is possible to build up glossaries. Definitions can be entered for selected words and then saved. Notes and comments can be made while browsing. A note is (literally) displayed in the margin to indicate a comment has been made. Highlighting the note symbol displays the comment. As with the glossary, notes can be saved.

The vocabulary function can be used to examine a given range of pages and list each distinct word found within. The vocabulary can be set to ignore 'trivial words' – which are held in a separate file and can be changed by the user.

An important aspect of the program is its ability to send data to a printer or to a disc as a straight text file which can then be loaded into a wordprocessor. When a reference is found in *Hyperbook* it is linked to a single line of text. When printing out, the program normally prints the three lines either side of the reference as well as the actual line. This extent can be changed to

whatever size is required. This is perhaps the only real limitation of *Hyperbook*, I would have liked to be able to link the extent to whole sentences.

Of course, *Hyperbook* is virtually useless without some pre-prepared texts. Longman Logotron is developing a range of such texts. At the moment there are 15 discs available – 13 as separate files, a demonstration green disc and the text file included with the *Hyperbook* reader. The green disc costs £5 and contains newspaper extracts on a range of environmental issues. Sample notes, glossaries and indexes are also provided on this disc.

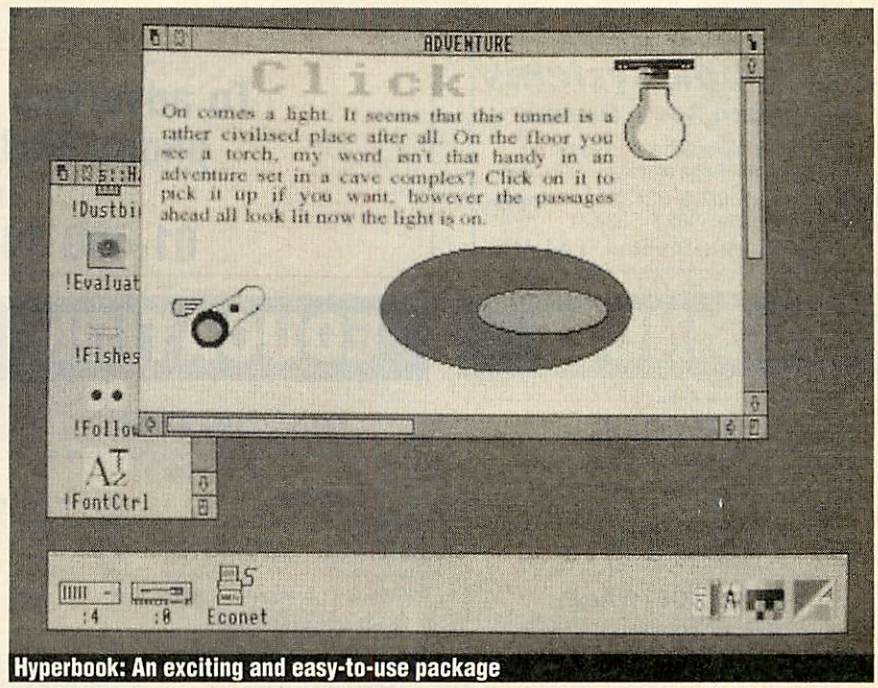
The *Hyperbook* reader disc, which is the main program disc for the package, contains a 58 page extract from the *Chronicle of the 20th Century* covering the years 1985/6. There are two full discs covering science and technology issues from 1988. Again these are in the form of extracts and articles from newspapers and magazines. Similarly there are two discs on geography and two on economics.

There is even a *Hyperbook* edition of *Hamlet*, presented on screen in the same way as the conventional printed text. Notes are included in the text and these can be amended or extended. There are texts on the Educational Reform Act, The Gospels, *Pride and Prejudice*, The French Revolution, *The 20th Century History Source Book* and a Pollution File.

Longman Logotron has also published a *Hyperbook* authoring system. While this will not appeal to the majority of users (would you fancy typing in the whole of *Hamlet*?) it does extend the versatility of the system.

Encoding can be done from a number of wordprocessors, including *First Word Plus*. For each wordprocessor, the instructions are detailed and easy to follow.

Hyperbook is an exciting program which provides easy access to a range of current information and classics. While the program is clearly aimed at the education market it will have a far wider appeal. The price of each text file is such that it will provide a most cost effective resource. The program is easy to use, the documentation is readable and comprehensive. Longman Logotron has scored a certain hit.



Hyperbook: An exciting and easy-to-use package

Bookbinder

Bookbinder is an application for the Archimedes that enables books to be built up from individual pages containing drawn objects, bit-mapped images (called sprites) and text.

Bookbinder is similar to some of the adventure books published in the last few years which give a series of options at the end of each page and, by turning to a directed point in the book, the story then continues on the basis of that decision.

A book is built up by creating each page using *!Draw*. The page can contain both text and graphics. When designing each page, there needs to be one or more object bounding boxes that can be selected to go on to another page. It is possible to use the rest of the screen as one of the boxes. Up to five links can be attached to each page, and there can be 200 pages in each book. It is possible to call up the same page through several different routes. This can save a considerable amount of time when creating pages. Once all the pages have been created they are assembled together and the links put in place.

Although this sounds quite difficult, the handbook assures the reader it is 'mind-bogglingly simple'. With one minor problem, it actually is.

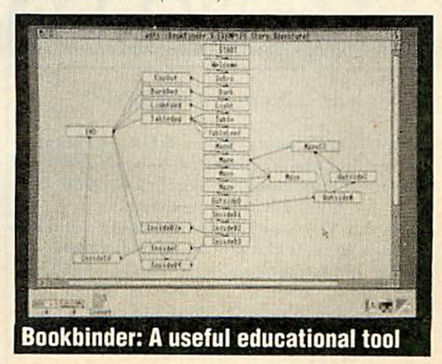
First the book reading application supplied on the *Bookbinder* disc is copied and given a new name. Next all the pages previously created are copied into the new book. Then a special window is opened with a start and an end box. The pages of the book are dragged into this window, where they appear as rectangular blocks with their filenames printed inside. These blocks can be positioned as required between the start and end marks. The links are then inserted by calling up an option from the menu. It was quite difficult to get the link fixed to the next page until I realised which part of the special pointer symbol should be inside the new page box.

From then on it is downhill. Links can be added, altered and deleted. Also the positions of the boxes could be adjusted until the layout of the planner looked right. To finish the book off, a new icon can be created for the book and it is ready to be used.

Bookbinder is an interesting program. It could find a niche in the education market where it would be a more versatile form of the BBC teletext programs. It is easy to use, well documented and has a wide range of applications from adventure generators to interactive tutorials.

The Hyperbook *reader disc costs £56.35 and most texts are available for £17.25 each from Longman Logotron, Dales Brewery, Gwydir Street, Cambridge CB1 2LJ. Tel: (0223) 323656.*
Bookbinder *costs £55 from Musbury Consultants, 8 Fairhill, Helmshore, Rossendale BB4 4JX. Tel: (0706) 216701.*

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LUCKY STRIKE

The Master is star of stage and 30 TV screens. CHRISTINA NEAL investigates

When Brian Kerr was working as a producer for Thames Television in 1983, a videotape of an American game show arrived on his desk. The show – a huge success in the US – displayed 30 monitors from which contestants selected their prizes.

There, the monitors were controlled by a series of Commodore computers and Brian's task was to devise a suitable system for a British version of the programme – *Strike It Lucky*. Rather than pick identical machines, Brian chose a network of BBC Masters and wrote his own accompanying software. 'I'd been a fan of the BBC micro since it first came out,' he says. 'So I analysed what was required and came up with a system using a network of Masters and one controlling computer. I set up a bank of eight computers feeding graphic information through to a video switcher matrix'.

After a few minor 'teething' problems, the technical side of rehearsals went well. Michael Barrymore was called in to present the show and the audiences loved it! The British version of *Strike It Lucky* had struck gold!

Several years later, the popular game show is still going strong. 118 episodes have been made so far and, with no less than 14 million viewers, it ranks highly in the nation's top 20 favourite programmes.

Throughout its successful run, the network of Masters have remained intact. Contestants call up their prize on the appropriate monitor before Michael can even think of shouting 'Awright'!

Brian explains how the system works: 'All 30 monitor screens you see on the show are fed back to the video matrix. Coming into the video matrix are signals from eight Master computers all connected by an Econet cable to the controlling computer which is a Master 128. This Master has an RS232 link to the video matrix so when contestants ask for four moves, the first four computers will be loaded with a prize or a hot spot, selected by the computer'.



Commands are sent down the Econet cable when the details on the monitors need altering. A signal from the video matrix sets off a sequence of yellow flashing stars. Another signal changes the colour of the lettering on the monitors in order to display the prizes. 'The prizes are already written on those blue monitor screens but they are written in blue so you can't see what they are until the contestant hits the button and the signal for a change of colour alters the lettering to white'.

It all sounds fairly simple but writing the software to run the system was a lengthy task. Although he had been using a BBC micro for personal use at home, Brian admits he spent countless hours developing it to work with his unique setup.

'From the American video I had to break down exactly what the sequence of the operations was in terms of what appears on the screens at certain times. From that I was able to work out what I could manage with a network of eight machines'.

'Contestants are allowed to ask for two, three or four questions at the most. So I broke down the various graphics into modules and then devised a controlling program to run it all together'.

The result was a system which even the zany Mr Barrymore has no qualms about.

'Michael can operate the system and has done so during rehearsals. He's quite good at it too. We're fortunate to have him present the show because he knows how to handle the computers. When he's filming, things get very exciting and the staff in the gallery are literally cheering people on.

'You might have a nice old couple who've reached the ninth monitor and if they reach one more, they'll win £3000. But we're powerless to do anything about it'.

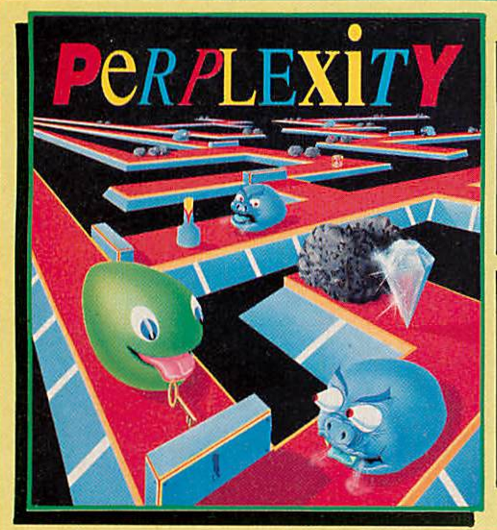
The future of the programme looks equally promising. Another series is planned for 1991 and Brian is hoping to replace the network of Masters with the speed and sophistication of the A3000.

'The A3000 looks an overall faster and more powerful machine. The technical departments here also use a Master network, so we're hoping to replace them with the new machine too'.

Until then, *Strike It Lucky* looks set to gain even more popularity. Brian's shrewd network and Michael's warm humour combine with a fun range of prizes which never fail to amuse the contestants.

'People do win holidays and trips on Concorde but we like giving away slightly unusual prizes like camping equipment and garden gnomes', laughs Brian. 'We'll keep putting them in too because it's more fun – making people laugh is the whole idea'.

THREE GREAT NEW TITLES FROM
SUPERIOR SOFTWARE




Unlock the Door


Beware the Monster

PERPLEXITY
3-Dimensional Strategy Game with Brilliant Graphics

PERPLEXITY consists of 16 increasingly difficult levels, each a puzzling maze with one of four different 3D background themes. Collect the diamonds by pushing together the boulders scattered about the maze and push the keys to the correct doors to open them.

But watch out for the monsters who will chase you around the maze. And watch out also for the 'mystery boulders', which may give you a bonus score or a magic potion, but may also reverse some or all of the movement controls...then you've really got problems!

On-screen information includes a constantly up-dating scanner/map, which allows you to plan your route, a score-line and timer/status icons. Passwords allow you to skip completed levels.

PERPLEXITY combines the best puzzling features of REPTON games with superb 3D graphics, to give a highly addictive and visually brilliant game. Are you ready to face the challenge?

(The Electron version has the same graphics as the BBC Micro version.)

PLAY IT AGAIN SAM 13
A New Top-Hit Four-Game Compilation

BARBARIAN II

Have you the skill and strategy to reach the Dungeon of Drax? Twenty gruesome monsters to defeat in an 80 screen maze.
"The monsters are spectacular in size and design. A most impressive and playable game"....Acorn User

PERCY PENGUIN

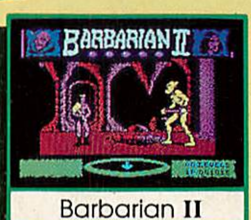
The classic and highly addictive game by Superior. Percy must kill the Snobees in the frozen maze by hurling ice cubes at them, but deadlier breeds then appear!
"Enjoyable to play with good graphics and sound"....A & B Computing

HYPERBALL

A brand-new release by Superior. The best version ever of the classic 'bat-and-ball' game, with 6 levels and a massive total of 120 screens. Special features include: infra-red scanners, 8-ball splitters, aliens, cannons, weapons' purchase, bonus rounds and screen-jump options.

PANDEMONIUM

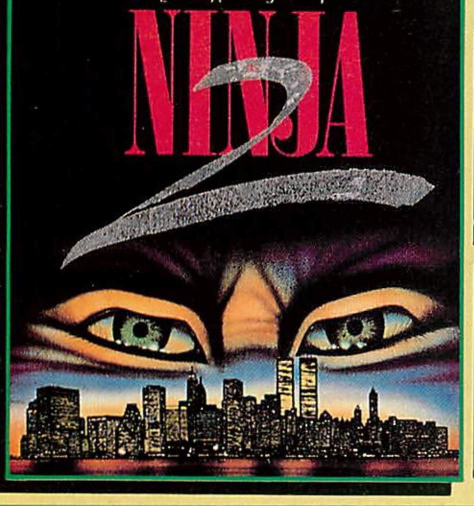
A brilliant 'Top Ten' game by Peter Scott, featuring teleporters, lifts, springs, weird aliens to shoot, and lots, lots more, as you attempt to construct the core.
"Eighty screens of fun make this game my favourite"....Micro User



Barbarian II


Hyperball






A Thug in the Cellar


Mugged on the Street

LAST NINJA 2 - Back with a Vengeance!

Born in a time of peace, lived in a time of war; the shadow warrior returns. Leaping the abyss of time he comes to fulfil his destiny!

DATELINE: 1990 **THE PLACE:** Downtown New York
THE QUEST: To destroy the eternal evil........Kunitoki!

Lots more fiendish adversaries, more colourful screens with superb graphics, a score-line, a timer... and lots and lots more exciting Ninja action. Are you ready for the thrills and skills of the Ninja in crime-filled Manhattan? Can you survive the six action-packed levels?

You start in the notorious CENTRAL PARK, with thugs, police and bees to get past, and shuriken stars and hamburgers to collect. Now to THE STREET, littered with down-and-outs and meths bottles. Take care in THE SEWERS to avoid the darkness and the crocodile. On to the forbidding opium factory in THE CELLAR and then to THE OFFICE and a secret computer code. Finally to KUNITOKI CASTLE with its immortal adversaries and the trickiest puzzle of all!

BBC Micro Cassette.....£9.95 each BBC Micro 5¼" Disc.....£11.95 each
(Compatible with the BBC B, B+ and Master 128 computers.)

BBC Master Compact 3½" Disc.....£14.95 each Electron Cassette.....£9.95 each
(The screen pictures show the BBC Micro versions of the games.)



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